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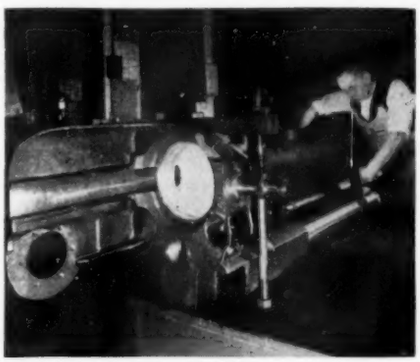
June 12, 1940



Plowshares Into Swordblades—*A printing press manufacturer turns to anti-aircraft gun parts under the educational order program*

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April 16, 1940

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Yours very truly

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"I refer to AMERICAN MACHINIST for buying new equipment..."

WHAT'S IN THIS ISSUE

HIGHER EDUCATION

In any business, nothing can take the place of "know-how." And nothing save experience can produce it.

So it is with metal-working. You just can't start turning out roller skates, or rifles, or shells, the day you get the blue prints. The Government learned that during the last war. And having learned it, the Government intends to profit by it.

The result has been an "educational orders" program for American industry. The idea, of course, is for certain manufacturers to familiarize themselves with production of one or two critical armament items, so that if the United States ever goes to war, industry could smoothly swing over to efficient munitions manufacture.

Most of the awards under the $14,000,000 1940 appropriation for this purpose have now been made. Among those receiving contracts was R. Hoe & Company, prominent printing equipment maker. On the following page begins a case study of the firm's educational order for 3-in. anti-aircraft gun recuperator mechanisms. It should prove highly interesting to those who speculate as to what happens when an industrial equipment producer begins to make munitions.

PROGRESS

Probably the most spectacular single metal-working development in recent years is the adoption of carbide-tipped tools. Though they permit cuts unthinkable a few years ago, unless used properly they can be a source of as many headaches as bathtub gin. Fortunately, both machine tool builders and carbide makers are doing their utmost to spread the gospel, so that these materials may be used to the greatest advantage of all concerned. Philip M. McKenna of McKenna Metals Company has compiled a lot of information on the correct grinding of carbide tools. You'll find it in "Curling Chips from Carbide Tips," on page 413.

DILEMMA

No one knows better than men engaged in small-lot production how intimately design is tied up with manufacture. In mass production, no tooling expense is spared to cut unit cost. In job-lot work, everything is done on general-purpose machines and the design worked out accordingly. But somewhere in between is a point where neither special-purpose nor general-purpose equipment seems to have the edge. Which to use? That's just the problem that confronted Cleveland Tractor Company in deciding how to design and make drive sprockets for its small tractors. Though these parts are made in lots of 500, general-purpose machines proved the answer—an answer made possible by some ingenious low-cost fixtures. The set-ups are discussed in "Knocking Out Sprockets," which begins on page 414.

HOW HARD?

It has long been customary to check high-speed steel draw temperatures with a Rockwell C hardness reading. Some of these readings are none too satisfactory, as there is a good chance for ambiguity. R. C. Gibbons, of International Harvester Company, has discovered that the magnetic properties of the hardened steel are often a better indication of its crystalline structure, and has developed a convenient method of checking them. Though not intended to displace Rockwell readings, this system gives promise of becoming a valuable technique in toolrooms and inspection departments. Mr. Gibbons tells all about it in "Magnetism Measures Hardness," on page 426.

R. C. GIBBONS

DIE DESIGN

"Most tool and die designers take little interest in die maintenance cost," says Joseph I. Karash, of the tool design department of Reliance Electric & Engineering Company. "They feel it is purely a problem of having the best grinding equipment the die usage justifies." That the maintenance cost problem involves much more than this Mr. Karash hastens to point out in the first of a series of articles on die design for low maintenance. In these days of mounting production, "Die Design for Low Maintenance," which starts on page 423, should be helpful.

JOSEPH I. KARASH

SHORTAGE

You've heard a lot about the shortage of skilled labor, especially in the aircraft industry. About how it's holding up production, and boosting costs, and to some extent balking expansion efforts. You've probably wondered what's being done about it. The answer is plenty. A case in point is Wright Aeronautical Corporation, which has embarked on a large expansion program and swung over to virtual mass production of engines. How the company cooperates with the city's Board of Education, and vice versa, in preparing young men for work in its shops is told in the article beginning on page 416. Entitled "First Aid for the Unskilled," it's by P. W. Brown and H. E. Linsley, both of Wright Aeronautical.

COMING

Flame machining is the topic up for discussion in a two-part article by J. G. Magrath of Air Reduction Sales Company. Much valuable practical information will be contained in each part, the first of which will appear soon in AMERICAN MACHINIST.

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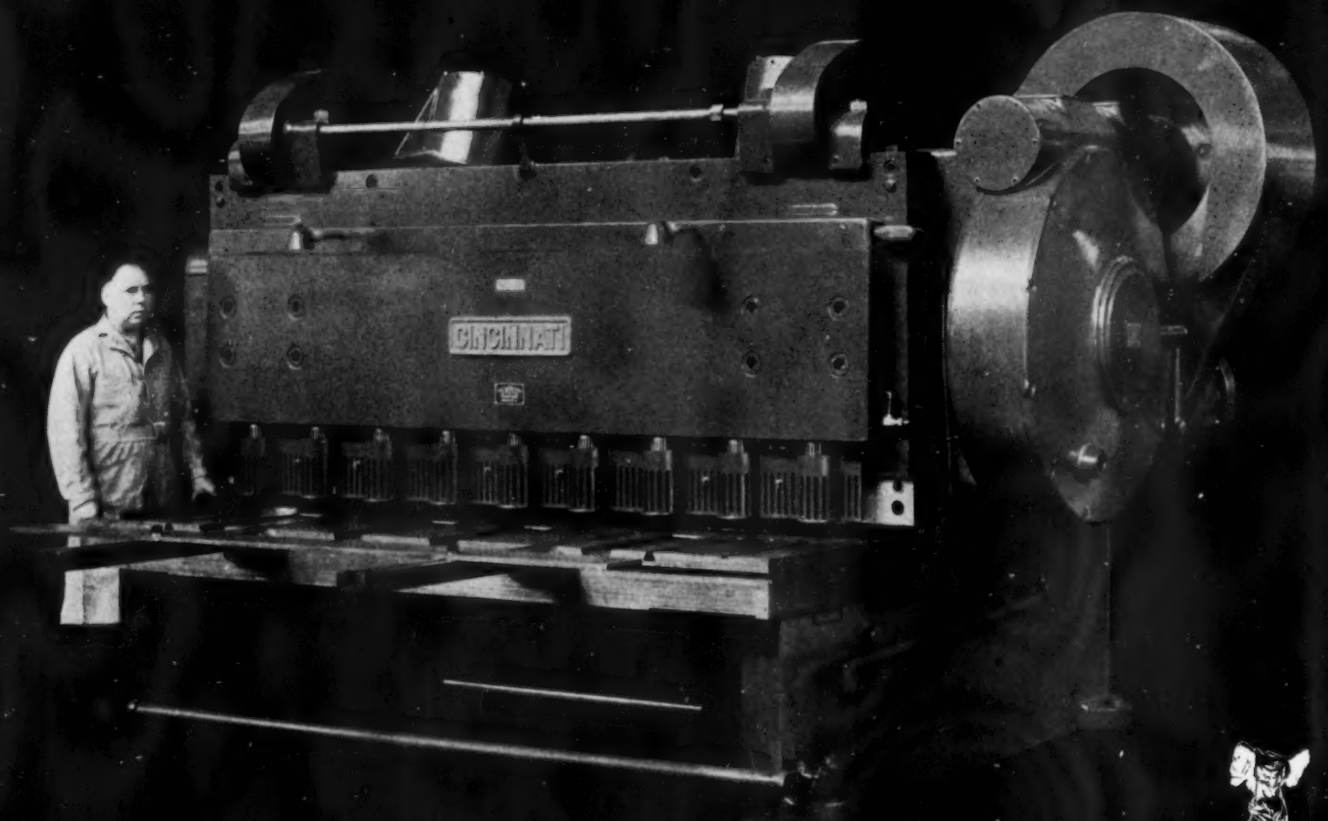


THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

SHAPERS · SHEARS · BRAKES

Painstaking hand finishing precedes assembly. When the trunnions are machined about 0.001 in. of metal is left on them; this is removed by a cast iron lap with oil and powdered adhesive

Industry gets educated

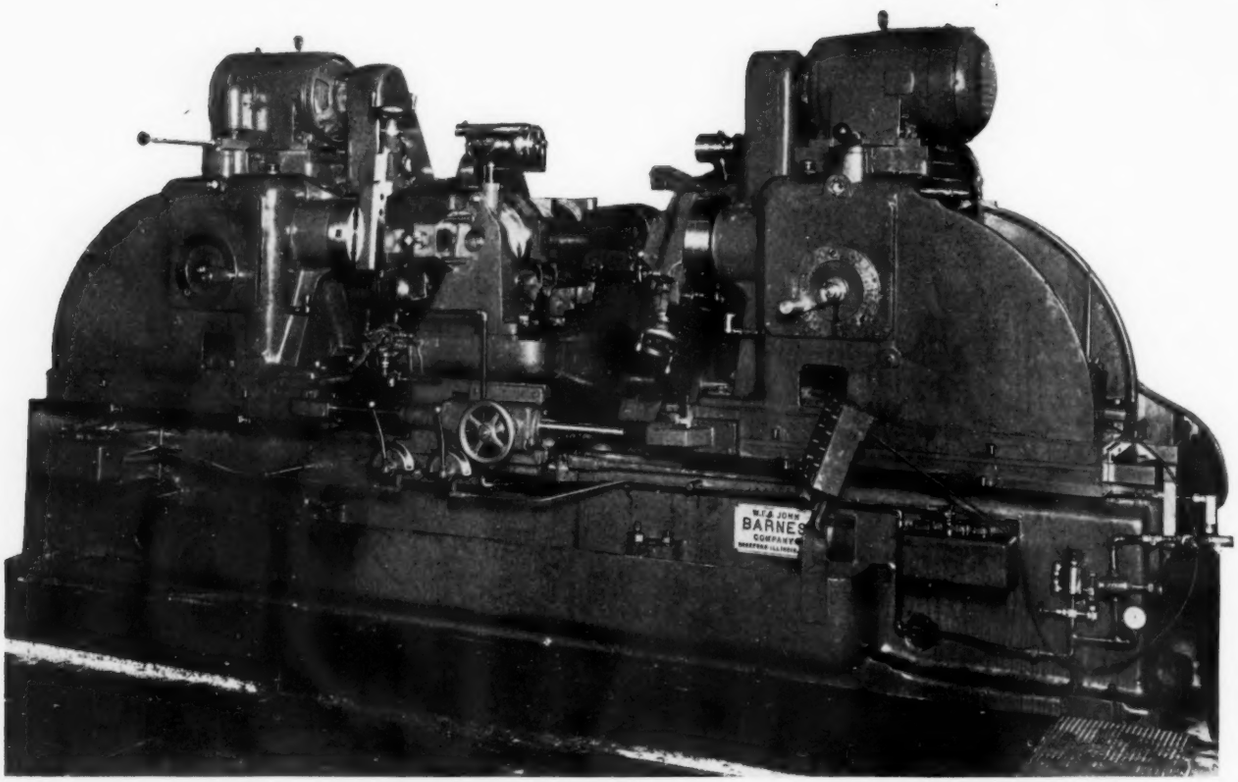
You've heard about "educational" orders. Here's how one of them was used to teach a printing press manufacturer how to make parts for guns

MODERN WARS are not fought by professional armies alone, but by the combating nations' entire resources. An essential part of any rearmament program is the preparation of these resources for any possible emergency. The European nations now at war recognized this fact and put it into practice years before the outbreak of hostilities.

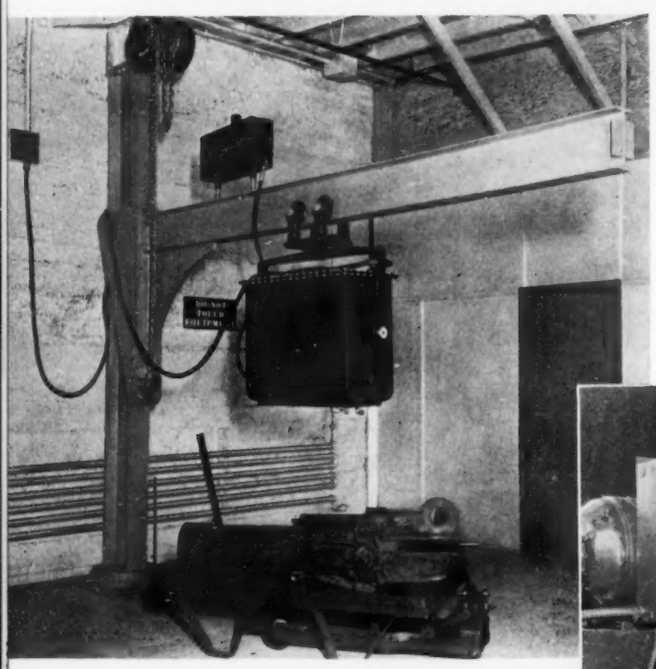
The United States may be said to be virtually without a peacetime munitions industry. Army arsenals and navy yards have been the sole means of keeping alive ordnance development and manufacturing technique. To some extent this has been due to public sentiment which has been opposed to the building up of vast works, such as Krupp and Skoda, supported in part at least by governmental armament orders.

When the policy of preparedness was adopted it became obvious that American industry had forgotten how to make guns. Machine and tool equipment was lacking; the special know-how ordnance making had become dimmed through years of disuse.

In 1938 Congress sought a solution to this situation by inaugurating the system of so-called "educational orders." It provided $2,000,000 for this purpose in its 1939 budget and in 1940 increased the appropriation to $14,250,000. The objective was to set up production machinery for key military items, to test these set-ups by orders for limited quantities and to



A special machine has been acquired to insure precise alignment of the trunnions. The work is located on large centers in the machined bore and by an expanding wedge block in the gun slide. Box tools turn and face the trunnions, while coolant is supplied through the center of the tool holders. The cutter heads then recede to permit the die heads, seen at the back of machine, to swing down and cut the trunnion threads



The sleeve of the recuperator cradle consists of a steel casing to which is welded a number of smaller cast and forged parts. To inspect the welds R. Hoe & Company, Inc. has installed an X-ray room equipped with a General Electric unit. The trunnions, which support the cradle and the gun itself, come in for particularly careful scrutiny

A Giddings & Lewis boring, milling and drilling machine is equipped to handle a large number of operations on the cradle. The piece is bored lengthwise and then crosswise by means of a special head while being supported by the trunnions and the outside of the sleeve. An internal milling attachment machines the gun slide slot (cutter may be seen just right of the trunnion). With the use of a second bar support and a sweep, the concave cradle yoke surface is machined from above

prepare a manufacturing schedule based on the experience thus gained.

Most of the awards under this legislation have now been made. In order to examine the tangible results obtained from them, a typical case study has been made.

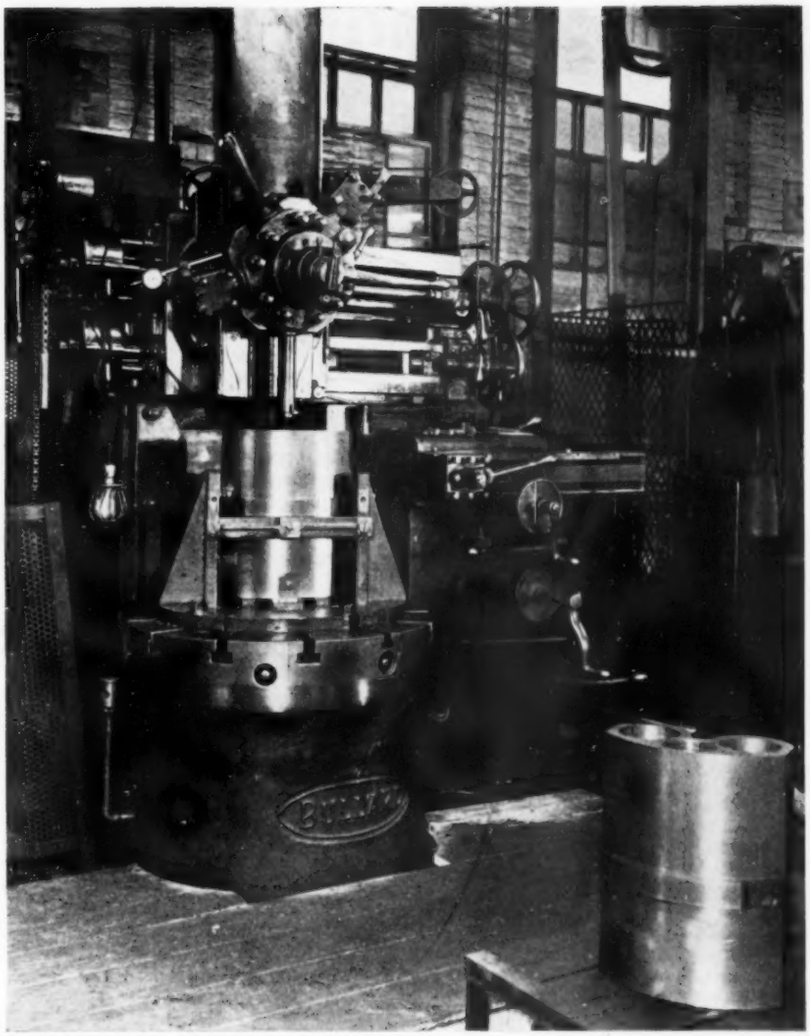
R. Hoe & Company, Inc., pioneered the development of equipment for the printing industry. For over 100 years this concern has built presses and other equipment for the printing trade.

At the inauguration of the educational order program, this concern was in the same position as many others engaged in the manufacture of various kinds of industrial machinery, through the use of equipment that could be adapted to the purpose of ordnance manufacture and the high degree of technical skill necessary for this type of work.

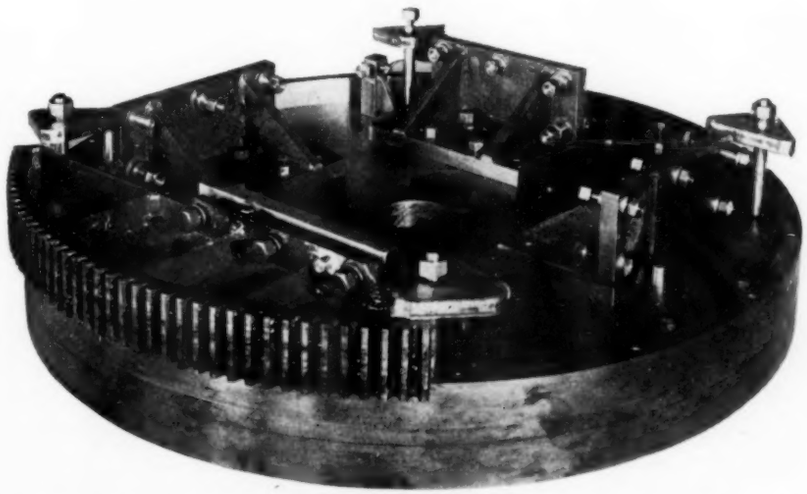
The War Department selected Hoe for an educational order, i.e., the manufacture of recuperator mechanisms for 3-in. anti-aircraft guns.

In this unit is mounted the gun proper. Its function is to absorb the shock of explosion and to return the gun to the correct position after each firing. Upon its precision in a large measure depends the accuracy of fire.

The main units of this mechanism are the cradle, the yoke, four cylinders, their pistons and rods, and various valve mechanisms. The recoil, recuperator, and air cylinders are of special metal, while the buffer cylinder is of steel. All must be precisely bored and finished. In fact the entire unit, despite its size, requires such precision that it virtually falls into the class of instrument work.



Three holes in the cradle yoke are bored in a vertical turret lathe. The holding fixture fits over a center plug in three positions to obtain proper relationship between the holes. Threading is done in the same set-up. Prior to this set-up the yokes are turned on the outside in a larger Bullard



Another special fixture is provided to hold four elevating racks during the turning and gear cutting operations. Turning is done in a vertical boring mill and gear cutting on a hobbing machine

Much of the R. Hoe Company's equipment was adapted for use on this order. This was supplemented by a trunnion turning machine, a long bed turret lathe, a horizontal cylinder finishing machine, an X-ray weld inspection room, an Electrolimit gage, and a completely air-conditioned room for inspection and assembly. In its modern toolroom R. Hoe & Company also manufactured all the jigs and tools required for mass production of their recuperators.

On this and the following pages are shown some of the operations performed by R. Hoe & Company during the course of this educational order. These operations demonstrate the way in which a printing press manufacturer had been educated in the making of gun parts. Thus one more link has been forged in the chain of national defense.

INDUSTRY GETS EDUCATED

After being bored in an extra long Gisholt turret lathe, cylinders are finished. A Barnes Drill Company machine is used for this work. The cylinders must be round and straight within close limits, and have no marks or scratches. Both turret lathe and finishing machine were installed expressly for work on the recuperators

Cylinders are inspected in an air-conditioned room using a Pratt & Whitney Electrolimit gage provided with a special extension arm and counterweight. Note the leveling base on which the cylinder rests

The air conditioned room is held at 68 F. and 50 per cent humidity. Light is furnished by G.E. daylight lamps. In addition to providing closely controlled atmospheric conditions, the room is dustproof assuring absolute cleanliness in the final assembly

Breaker grooves for carbide tools

BY PHILIP M. Mc KENNA, Mc KENNA METALS COMPANY

Steel-cutting carbide tools used at high speeds produce hard-to-manage chips which can be curled and broken by using ground-in breakers

TURNING CUTS on smooth bar stock or finished forgings, second roughing cuts and finishing cuts at high speeds on tough steels of medium hardness call for chip breakers or curlers ground in the tool point unless auxiliary clamp-type breakers are used. Grooves required to curl and break tough steel chips machined with tungsten-titanium carbide tool materials need not be deep. A gash or trough only 0.010 in. deep, from $\frac{3}{32}$ to $\frac{1}{8}$ in. from the cutting edge, will convert ribbons of steel into neatly broken coils.

Fig. 1 shows a turning tool with such a trough ground free-hand on the top surface of the tip. Chips made when turning tough chrome-nickel-molybdenum steel with such a tool are shown in Fig. 2. The feed was $\frac{1}{16}$ in. per revolution and depth of cut about $\frac{1}{4}$ in. Prior to using the chip breaker trough the chips came out in long ribbons, difficult and dangerous to handle in the shop.

The advantage of this form of chip curler is that it is ground in free-hand on the peripheral edge of a cup or disk wheel of the loose-bond silicon carbide variety available for grinding carbide tools in most shops. Such wheels may be used for free-hand grinding. Diamond - impregnated bakelite-bond wheels should be used when surface grinding in fixtures or on magnetic chucks. Free grinding with gentle hand movement keeps the wheel free cutting.

When surface grinders are available, diamond-impregnated bakelite wheels can be used to grind a step either (a) parallel to the side cutting edge of the tool and removed from the edge a distance of about three or four times the feed, or (b) inclined at an angle of about 20 deg. to the cutting edge and at a distance of three or four times the feed where the step reaches the end of the tool. Where the step is parallel to the cutting edge the chips will be coiled. If the step is at an angle the chips will be broken into short lengths against the unturned shoulder.

There are a number of designs for clamping chip breakers on tools, but these are practical only when uniform conditions prevail. The ground-in chip breaker, whether a trough or a ledge, is more flexible and may be used on a variety of work. These ground-in forms are more satisfactory on steel-cutting carbide tools than on high speed steel tools because the form is preserved longer.

Chip breakers are not needed where interrupted or "jump" cuts are taken. Nor are they required on tools turning rough forgings, as these usually have sufficient surface irregularity to cause the chips to break up or curl in short lengths, like those shown in Fig. 3 which were produced with a carbide-tipped tool having a plane top surface when turning a nickel-chrome-molybdenum forging.

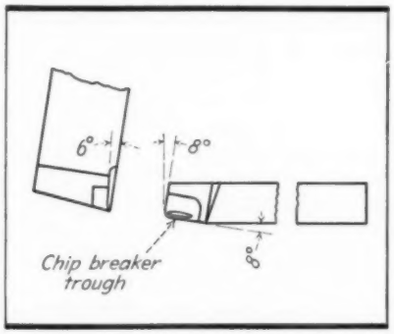


Fig. 1—A gash or trough only 0.010 in. deep is sufficient to curl steel chips turned with a tungsten-titanium carbide tool

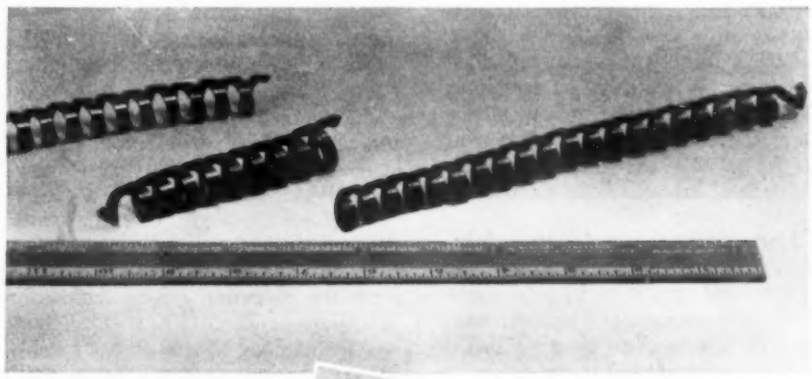


Fig. 2—Chips made when turning tough chrome nickel-molybdenum steel with the tool shown in Fig. 1 are tightly coiled

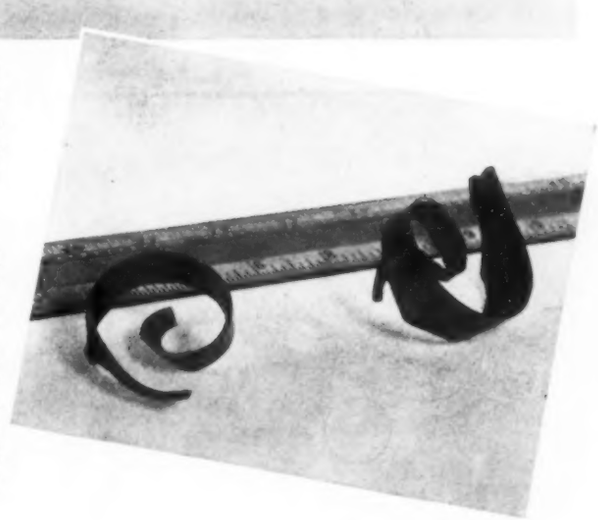


Fig. 3—Chip breakers are not needed for interrupted cuts or for rough-surface forgings. These chips were turned from a nickel - chrome - molybdenum forging with a carbide-tipped tool having a plane top surface

Knocking out sprockets

Built-up tractor sprockets turn out to be cheaper than the cast variety. Fixtures for notching and hardening turn the trick

Sprocket teeth are finished by hobbing after the sprocket is assembled. Cutting time for eight wheels is two hours, so the operator runs nearly all of the other machine tools in the department

PRODUCTION OF DRIVE SPROCKETS for the small "Cletrac" crawler tractor made by Cleveland Tractor Company is typical of an intermittent operation for which methods and tooling must be balanced against cost and quality. These sprockets are of built-up steel construction with flame-hardened teeth, and represent a design that is at least as serviceable as a cast-steel sprocket and is cheaper to manufacture.

Each sprocket consists of a formed disk to which two rings are riveted to obtain sufficient thickness of metal for the teeth. Press-shop operations on the SAE 1045 steel disks, bought in the form of hot-rolled circular blanks, are as follows:

1. Perforate the center hole, leaving $\frac{1}{32}$ in. per side for reaming. This hole is used as a pilot in subsequent forming operations, and enough stock must be left to clean up after them.
2. Form the center portion.
3. Form the outer rim.
4. Pierce the five stud holes around the center hole, leaving enough stock for reaming, and pierce the five lightening holes.
5. Notch the sprocket teeth, leaving about $\frac{1}{16}$ in. for hobbing.

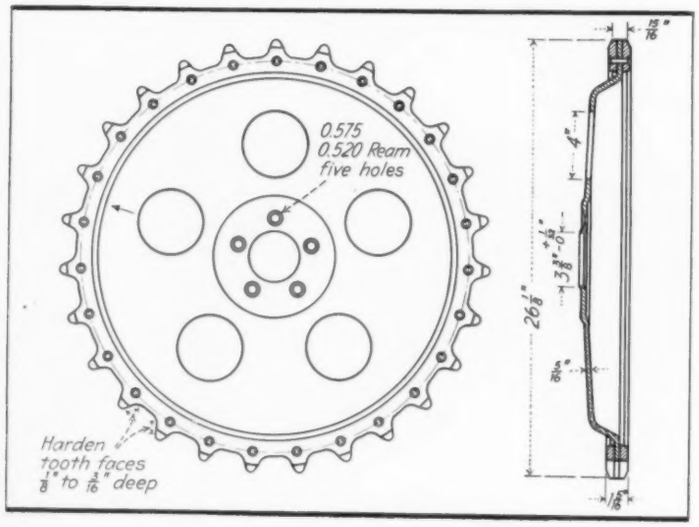
Press-shop operations on the welded SAE 1045 rings consist of:

1. Notch the teeth, using the same die as for the disk.
2. Size and flatten the ring to eliminate any distortion arising from the notching operation.

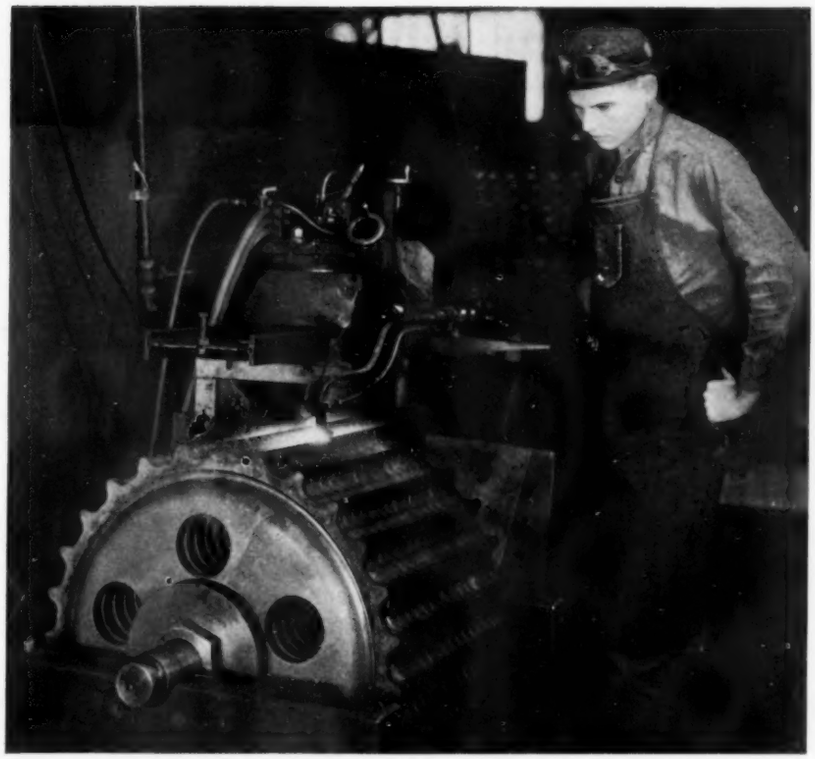
All these operations, except notching, are carried out with conventional low-production tools. Ordinarily they are set up for only a few hours, or for a shift at most. The notching die, designed for interchangeable use on rings and disks, saves cost, minimizes errors, and achieves a production of 60 pieces an hour. It cuts nine notches per stroke, equally spaced around a disk or ring, and is indexed so that all 27 teeth are notched in three strokes. Adaptor plates permit handling both rings and disks in the same tool.

To notch a disk, an adapter plate is laid in the die, the plate being free to turn on a plug fitting into a hole in the bottom of the die plate. This plate has three indexing notches *A* engaged by a plunger *B*. After the first stroke with the plunger in the position shown, two indexings complete the operation. The disk is accurately located over three buttons *D* which engage stud holes and by a block *F* which enters a lightening hole stamped with an arrow. This arrow also locates the work when setting up for hobbing and flame hardening.

A locating plate, used when notching rings, backs up the interior of the rings against the pressure of the cut. After the first stroke, the ring is moved counter-clockwise so that a notch can be engaged by the indexing



Material is saved by using $\frac{5}{16}$-in. steel plate for the wheel disk, two welded rings being riveted to the disk to secure sufficient width for the teeth



Flame hardening the sprocket teeth requires no expensive hardening and quenching equipment, is economical, and does not distort the pressed-metal wheel assembly, because the flame is confined to a small area

plunger *K*. After the second stroke, the ring is indexed once more to complete the notching operation.

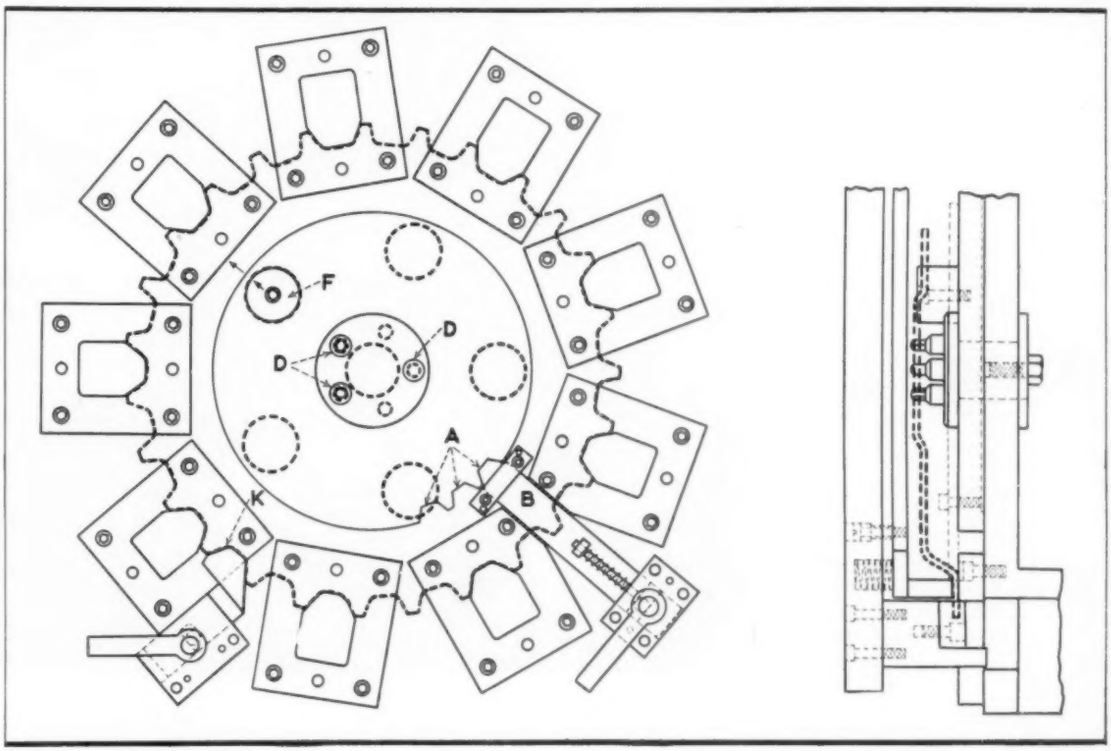
Before a disk is assembled with two rings, the center hole is reamed with a piloted tool and the five stud holes reamed and countersunk on a radial drill equipped with a Magic chuck for quick tool changes. Countersinking must be done accurately because wheel alignment depends upon the seating of formed nuts in the holes. The countersinking tool is piloted.

The rivet holes in the disk and rings are drilled on a Natco upright drill equipped with a multiple-spindle head which does half the holes in one setting of the fixture. Remaining holes are drilled after the fixture is indexed. Rings and disks are drilled separately, and are marked with a reference point for alignment purposes at assembly. Rivet holes in the rings are countersunk on one side to permit a tight riveting job. A sprocket assembly is made by laying a ring, the disk and another ring in a fixture which rotates under the ram of a horn press equipped with riveting tools.

Eight sprocket assemblies are hobbed at once on a Gould & Eberhardt machine. The cycle consumes about two hours, giving the operator time for all the preceding machining operations except drilling. He also tends the flame-hardening machine. Accurate location of the work for hobbing is obtained by mandrels in the fixture which engage the center hole, the large hole identified by the stamped arrow, and two stud holes.

Sixteen sprockets are hardened at once in the flame-hardening set-up. These sprockets are clamped tightly together on an arbor to prevent space between the teeth, which would cause uneven hardening. A specially made head fits the tooth outline and moves along the work at 7 in. per min. Depth of hardness penetration is from $\frac{1}{8}$ to $\frac{3}{16}$ in. Hardness is raised to 70 schleroscope.

As a final step the center hole is again reamed to compensate for any distortion set up in riveting. The piece is located from the stud holes.



Notching in a die is the quickest method of producing rough teeth in disks and rings. With nine punches with back-up heels around the blank, either a disk or ring is completely notched in three press strokes

First aid for the unskilled

BY P. W. BROWN AND H. E. LINSLEY, WRIGHT AERONAUTICAL CORPORATION

Wright's plant expansion wasn't a question of machines alone. New men were needed. Since experienced workers were not available, a large scale training program proved essential

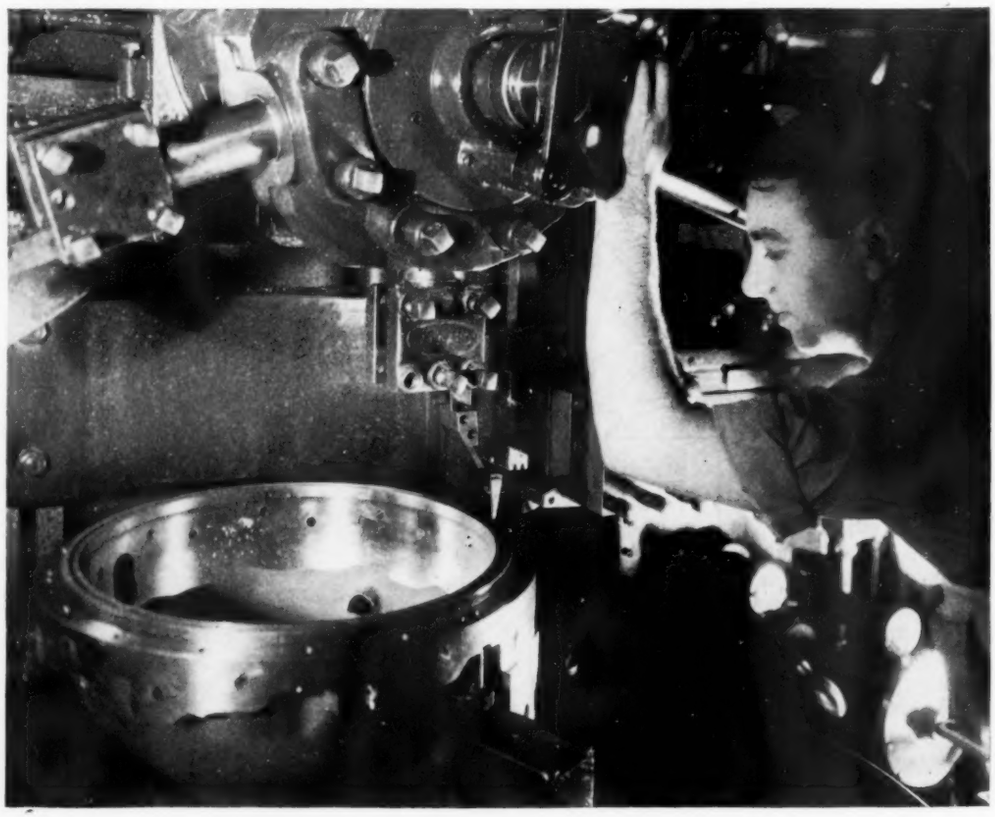
THE ERECTION of an additional plant, the selection and installation of new equipment, and the re-arrangement of existing facilities have not been the only problems faced by the Wright Aeronautical Corporation in carrying through successfully its current expansion program. With the initiation of a mass-production program, the shop personnel, accustomed to handling general purpose and semi-automatic machines, must be instructed in the operation and maintenance of new special-purpose machines. In addition, a large number of new employees must be engaged and trained.

One of the greatest obstacles in the way of heavily increased production is the lack of an adequate supply of skilled men. In spite of the semi-automatic and automatic nature of many of the machines, they cannot be operated by wholly unskilled workers. The extreme precision required in aeronautical engine work demands a type of worker not easily procured. Once the available supply of experienced workers has been exhausted, the only course left open is to establish a training program for the unskilled.

The Wright Aeronautical Corporation is meeting this problem in two ways: By engaging as many as possible of the local vocational school graduates who have majored in machine shop practice, and by arranging with the local Board of Education for a special four-weeks' intensive vocational training course. Although the company exercises no measure of control over the selection and training of these students, it naturally is consulted as to the type and degree of training necessary to fit graduates for employment in its plant.

Students must be between 20 and 30 years of age, American citizens, and residents of the city of Paterson. Preference is given to those who have dependents and who have some degree of mechanical experience. These restrictions are imposed by the school authorities and are subject to change as the number of students dwindles. Inasmuch as these men are trained primarily for employment at the Wright plant, they are given a medical examination by the plant's medical staff to determine their physical fitness before being accepted by the school. They are trained in the same type of machines as those to be found in the Wright plant. Furthermore, in order to familiarize the students with the particular materials with which they will have to deal, like aluminum and magnesium alloys, the company sends many of its scrapped parts to the school. Thus, the students can work on actual parts, finishing them according to Wright's blueprints and operation sheets.

The first week in school is devoted to blueprint reading, to the use of gages, and to a study of elementary shop mathematics and shop science.



Aeronautical engine work requires a type of skilled worker not easily found today

At the end of his first week of study, the student is graded and those who fail to pass are dropped from the course.

Successful students then are put to work in the school's machine shop, and, according to their classroom ratings, are allocated to higher or lower classes of work. No attempt is made to turn out finished mechanics and, at the end of the course, the graduates are given employment at the Wright plant on the same type of machine as they operated in the school.

When first employed, the student is rated as a learner and is assigned merely to stand beside a skilled operator and watch his every movement. After a time he is permitted to load and unload the machine, clear away chips and make himself generally useful. Later he is permitted to take roughing cuts and then, finally, to take finishing cuts and gage the parts.

As soon as he becomes proficient he is put to work on his own machine at the minimum operator's rate and is eligible to participate in the group bonus plan. From this point on, his progress depends entirely on his own ability.

Some of the students remain at one machine, or even one operation, as operators. Others, who show real interest and ability, may be moved from one machine to another as opportunity occurs. When this system first was introduced, it was expected that the period devoted to observing would last from four to six weeks. Experience has shown that in most cases, thanks to the preliminary school training, operators are capable of going "on their own" within two weeks.

Vocational school graduates are treated in the same way except that they are not required to take the preliminary training course. Under normal conditions, the students may be expected to advance more rapidly because of their longer and more diversified training.

The mere training of semi-skilled operators does not, however, solve the whole labor problem. Certain tasks can be performed only by highly skilled men and some way must be found to obtain these. The increase in the number of employees naturally calls for an increase in the number of supervisors, inspectors and instructors. These must, as a general rule, be taken from the ranks, as only those who have a thorough understanding of current methods and of the difficulties to be encountered are suitable for these positions. This, in turn, necessitates a special course for foremen just to train those men for their new responsibilities.

The NYA and the Machinist

APPROXIMATELY 50,000 young men are employed in National Youth Administration workshops throughout the United States. These shops give wide experience in such fields as carpentry, wood-working, auto mechanics, airplane mechanics and sheet metal. Most of the boys are getting a type of experience which might qualify them to become machinists.

These youths receive instruction and experience in four main types of work: blueprint reading, shop practice, shop theory and job analysis. Under blueprint reading they get general information concerning blueprints, orthographic projections, detail blueprint reading and assembly blueprint reading. Shop practice for those in the metal department involves elementary training in such common types of jobs as filing, bending, hand riveting, pneumatic riveting, forming and bumping. Under shop theory come instruction in sound work habits, types of tools, limits and tolerances, safety, employment rules and regulations and knowledge of essential parts. Through an analysis of the job, the NYA worker learns about various parts of his job in some detail and estimates the manipulative ability required and the technical knowledge needed.

The Federal Government's Interdepartmental Committee on Mechanics' Training for the Aircraft Industry, for example, has directed the NYA to give mechanical aptitude and vocabulary tests to all workers on projects of a mechanical character. The NYA has also been directed to draw up a list of all workers who have shown high aptitude and who, as a result, might fit into certain phases of the aircraft industry. Since about 60 per cent of the aircraft workers are semi-skilled and the majority are employed in sheet metal work, a detailed technical information circular on aircraft metal work has been drawn up for use by NYA supervisors. A number of projects in this field have been instituted for those youths who have shown the highest qualifications.

Some of the largest NYA projects where youths may receive pre-apprentice training in aircraft metal work are located at the naval station in Algiers, La., at the naval ordnance plant in South Charleston, W. Va., at Quoddy Village, Me., and at Weiser, Idaho. All the 1,200 boys on these projects, however, are not concentrating on metal work; each one is rotated among a number of other jobs such as airplane mechanics, electrical work, radio, carpentry, welding, plumbing and steam-fitting.

At the Weiser project during March, for example, 41 boys were enrolled in the mechanics division, of whom 13 were in the welding unit, 7 in the sheet metal unit, and 21 in auto mechanics and transportation. These youths constructed an automatic land leveler, completed a three-story fire escape, built metal tables for the kitchen and dining hall, and thoroughly overhauled three Chevrolet trucks. Four of the young men obtained private employment.

Chip studies in wax

Saw blades produce chips in wax similar to those generated by the same tooth shape when sawing metal. Apply this idea to avoid costly experimenting

IN ORDER TO SEPARATE purely speculative designs of new metal-saw tooth forms from those more likely to prove of practical value, thus warranting further research investigation, some economical method of giving the various designs a preliminary test is highly desirable. Such a test must employ in principle the function of a metal-cutting saw under actual working conditions.

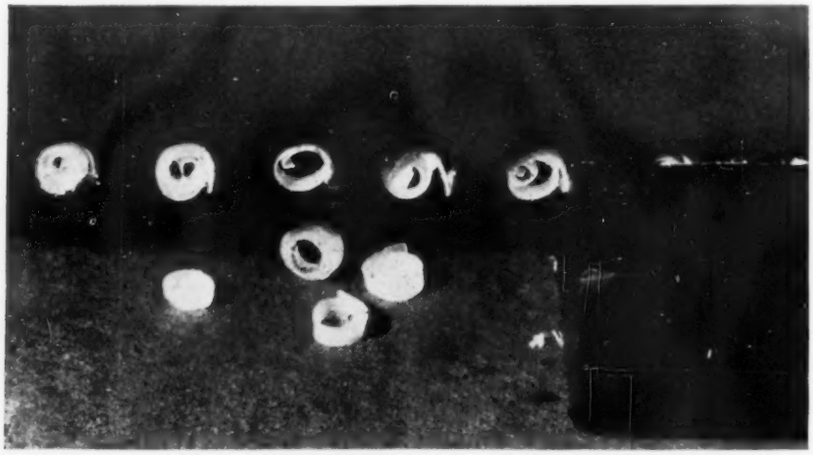
Pure paraffin wax blocks can be used for this purpose. These blocks have a consistency which yields a chip from a metal saw very similar in contour to that generated by the same tooth when cutting metal.

One of the principle advantages of using wax test blocks for studying the chip forms of metal saws is in the speed with which a theoretical design can be translated into an experimental tool and put into operation. Saw blades having enlarged teeth can be made of soft brass strip and tested for proper chip-forming action before the greater expanse of machining the same design in tool steel and heat-treating is incurred. Also, where an undesirable chip form is the first result, the soft brass teeth can be reshaped, the set and hook altered until satisfactory results justify translating the final result into an actual metal-cutting saw.

This simple yet effective means of testing the action of metal-cutting teeth has been used by Hans Ernst, Cincinnati Milling Machine Company and possibly by others. In fact, it would be surprising if the method were not quite old for the results obtained are effective and secured at little expense. In any event the method is worth of wider adoption by those interested in the subject.

The Photographic Technique

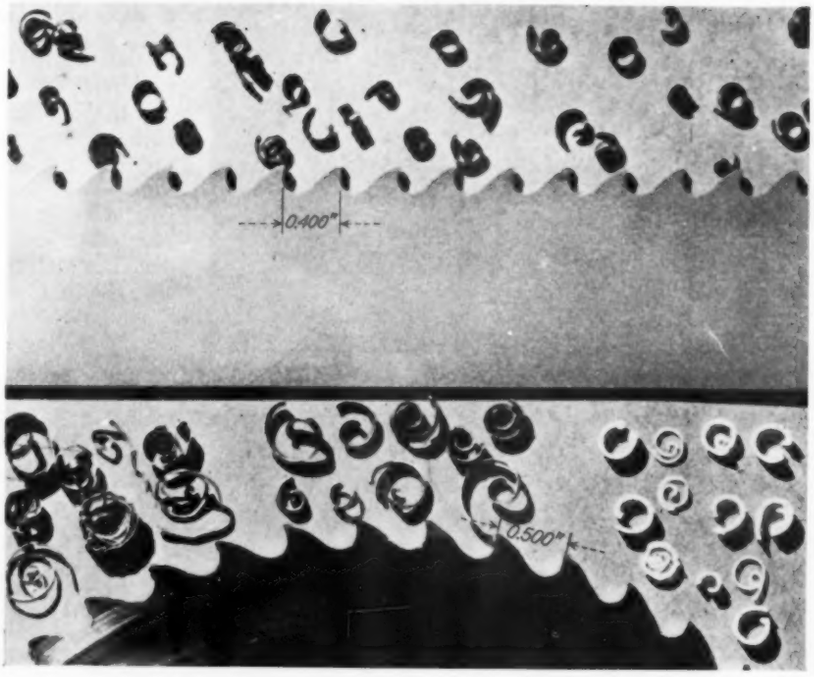
The paraffin wax blocks used to make the illustrations were $\frac{5}{8}$ in. thick, $2\frac{1}{2}$ in. wide and 5 in. long. Only clear wax was used. Wax showing a frosted texture when held to the light yields a chalky brittle chip that does not curl satisfactorily. To avoid excessive hallation and to secure contrast between the chip and the wax block, it was necessary to apply a flat finish to the blocks. It was found that a liquid leather finish of mocha color, which dried quickly with a flat surface, photographed best.



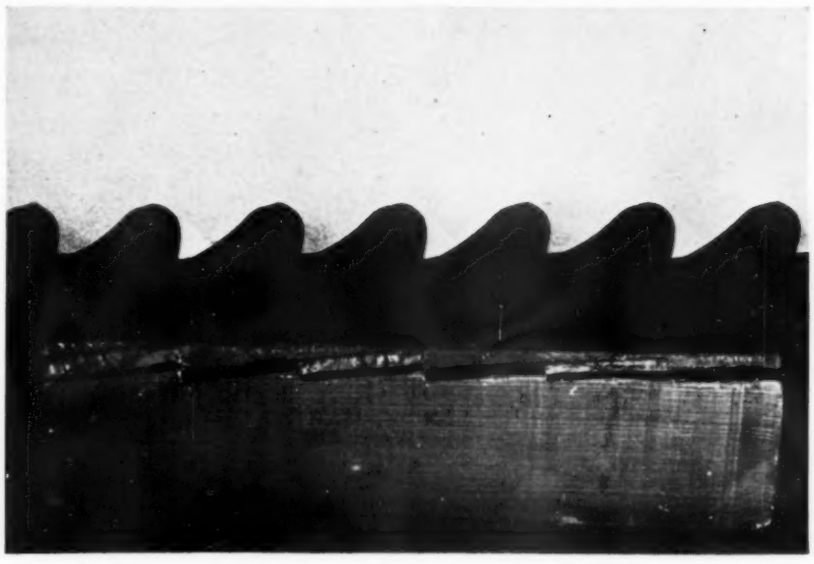
Wax chips made with an experimental power hacksaw blade reveal the type of chip it generates when cutting metal. In this case, the continuous curling action of the chip is due to the generous radius of the gullet and the 10-deg. rake or hook of the cutting face of the tooth. Note the utter absence of hairlike spiral chips which, in metal, pulverize in the cut and cause excessive tooth wear through abrasive action.

Without rake or hook a saw blade generates in the wax test an entirely different form of chip than that made by a tooth form having a definite rake. Here the chips show a strong tendency to either climb the face of the tooth and jam in or shoot ahead of the tooth, thus becoming wedged in the cut and retarding efficient cutting action. The experimental blade has four teeth per inch.

Steel and wax chips made by the same power-saw blade, shows how the rake or hook of the tooth has generated in both widely dissimilar materials an unbroken curled chip. The spring action of the steel expanded the chips upon clearing the cut.



Comparison of chips from a power hacksaw blade and a circular saw, both having the same tooth form, shows the results obtainable by studies in wax. Above the teeth of the straight blade are shown the chips produced from hard chrome-molybdenum steel. Above the circular saw, from left to right, are chips from a tough copper alloy, a hard nickel steel, and wax. The similarity of the chip form in each instance is striking.



The bottom of a cut looks like this when the hacksaw blade is lifted by the cam action of the machine at the end of the cut. This is a cross-section through a saw cut in a wax test block. The action of the teeth is a forward and downward cutting action and leaves a series of ratchet-like "teeth" on the bottom of the cut. In wax this condition is exaggerated, but in steel, especially under heavy feed pressure, this condition causes shock to the saw teeth on the next cut and may be a contributing cause of excessive tooth wear, especially in material of a high Brinell. Possibly a less abrupt rise and a higher lift of the cam is the suggested remedy here.

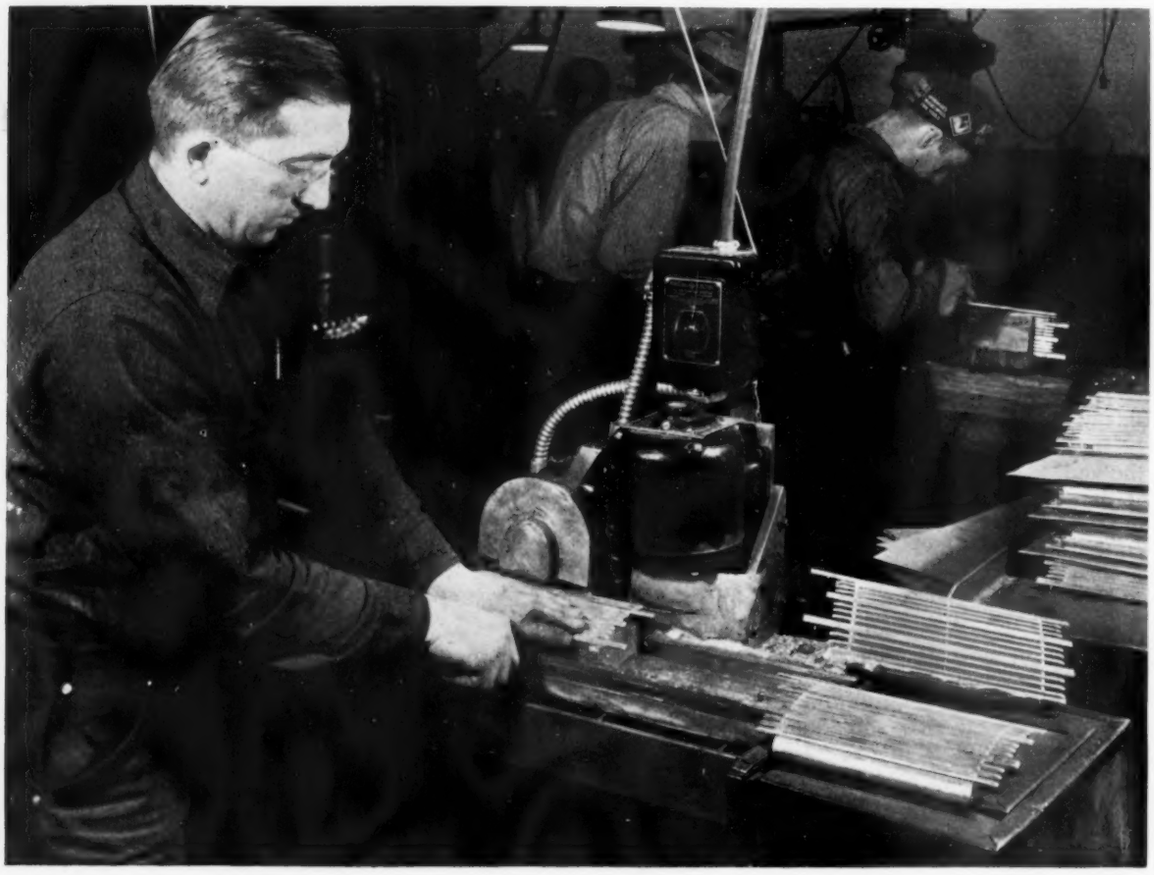
Flash on projections of kitchen-mixer parts is sheared by a cam-operated slide in this punch press set-up. Rest of flash is sheared by the punch

Trimming flash

BY HERBERT CHASE

Flash must be cut from most die castings. Removing it can be hard or not, depending on your ingenuity. Here's how five tough jobs were licked

FLEXIBLE TOOLING ARRANGEMENTS for machining constantly changing lots of die castings in countless shapes are required by all die casting establishments. Large die casting plants, such as Stewart Die Casting Division of Stewart-Warner Corporation, sometimes use special tooling in standard machines, sometimes find it more economical to make special machines. Either solution may be the



A special machine having three circular saws cuts flash from die-cast automobile radio grilles at the rate of 500 parts per hour

from die castings

right one to the ever-present problem of flash removal.

Automobile radio grilles are produced and machined by Stewart at the rate of 2,400 per eight-hour-day. Most of the flash at the die parting on the under face of the grille is removed with a trim die in a punch press, but other flash along one side of the casting, part of it adjacent to a slot cored next to a quarter-round section, cannot be cut away with this die. It is removed and the slot cleared by a special machine having a slide to carry the work past motor-driven saws. A horizontal motor spindle has two circular saws about half an inch apart. One cuts flash from along the edge of the slot, and the other trims it from the outer edge of the casting at the edge of the quarter round. A vertical motor carries another saw, which clears the slot of any remaining flash.

All three cuts are made at one traverse of the holder, which is moved by hand. With this machine, one man trims 500 castings an hour. The workholder ways rest on a cast-iron grid having many large openings, the sides narrowing into a hopper below. Flash and chips fall through the grid and collect in a box for return to the melting furnaces. Many benches of this type in this plant help keep floors clear of chips.

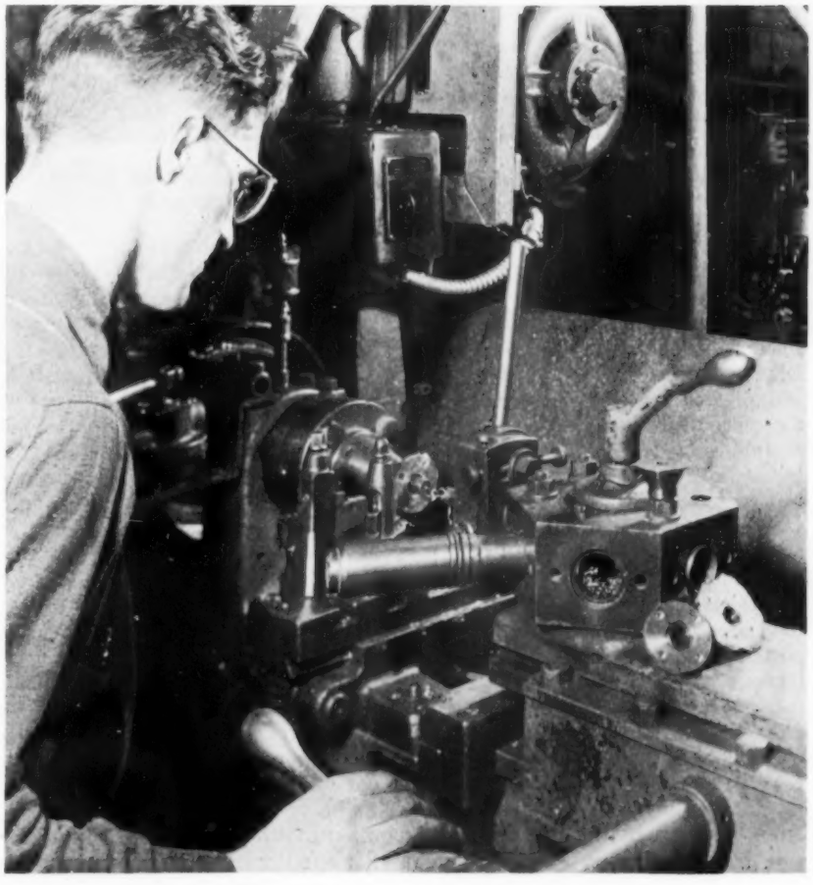
Combination Press Tools Used

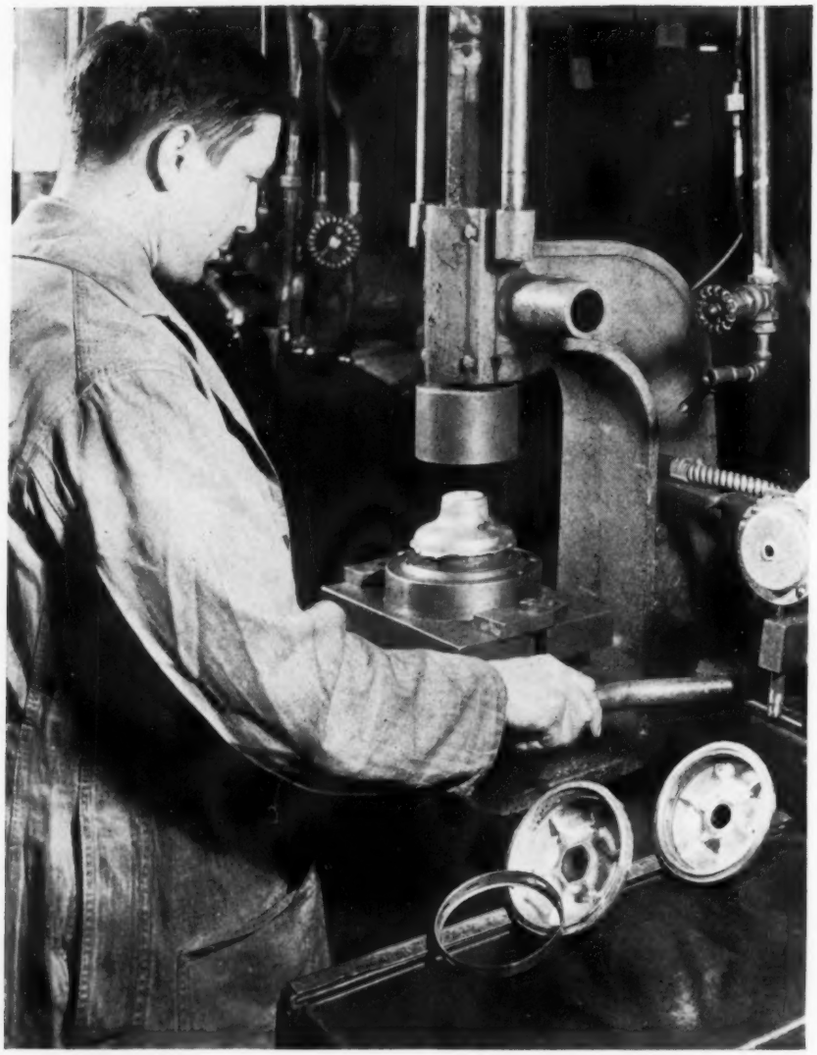
Bearing caps for a kitchen mixer have an irregular parting line and twelve narrow slots which are cleared of flash by a combination punch in a punch press. The casting has a right-angle projection at one side, and this projection as well as three small holes cored in it must also be cleared of flash. This is accomplished by a horizontal slide mounting the required tools. A cam on the punch advances the slide, which is returned by a spring. An air jet attached to the die blows out chips. About 550 pieces an hour are cleared of flash with this arrangement.

Bezels for some automobile instrument panels, also die cast in zinc alloy, measure 7¾ in. in outside diameter. The sprue for this casting is in the center, and from it radiate four gates to feed the metal in casting.

A turret lathe cuts gates and flash from this automobile instrument panel bezel. Note gates inside bumper recess, left, and ring of flash hanging on spindle, right

Runout of these flanged parts cast with steel bushings in the center must be held within 0.001 in. A chromium-plated mandrel and Carboloy tools help do the job successfully in a turret lathe





A hydraulically operated arbor press forces a steel ring into an automobile steering wheel hub and at the same time trims flash from the outside

Flash occurs at the die parting, which comes at the maximum diameter, next to which is a step to a diameter $\frac{1}{4}$ in. smaller. Machining is done in a turret lathe with the piece gripped on an inside diameter slightly larger than the central opening. Cored holes and push-out lugs having flash and irregularities along the rear face of the ring are faced off by a tool on a lever which the operator advances after the bumper in the turret is pressed against the front face of the bezel. A tool inside the bumper cuts off the gates and flash around the central opening, the portions cut away falling inside the bumper recess. Another tool on the turret above the bumper cuts flash from the outside diameter. This tool overshoots the latter diameter, dropping part way down the narrow step to cut off any "whiskers" resulting from the cut it has made on the outside diameter.

Another turret lathe job, formerly requiring four separate operations, is now done on a $2\frac{1}{4}$-in. diameter flanged part having a steel bushing cast in the center. The bushing hole is $\frac{5}{8}$ in. in diameter. The flange is faced, the central portion around the bushing counterbored, and the outer edge beveled. When finished, the face and counterbore must not show more than plus or minus 0.001 in. indicator runout.

Non-Stop Operation

A chromium-plated mandrel in the lathe headstock fits the bushing bore tightly, the piece being pushed onto it by a bumper in the turret. An air-operated push-off permits the mandrel to be reloaded without stopping. Facing is done with a Carboloy tool on the cross slide. Another tool on this slide chamfers the flange outer edge. The counterbore is machined by a turret tool. Some 200 castings an hour are finished in this set-up.

A certain automobile steering wheel hub is a simple die casting fitted with a steel bushing insert at the center. Three pairs of flat spoke holes are cored at the outer diameter, and between each pair is later drilled another hole for a circular spoke. The spoke ends are subsequently welded to a steel ring pressed in after casting. Holes punched in this ring must register with those in the casting. Register is insured by a nib which engages a corresponding notch in the ring. The casting has flash at its maximum diameter, where the die is parted. To remove this flash, the hub is mounted in a light arbor press equipped with a hydraulic ram and fitted with trimming tools. To avoid an extra operation in pressing the steel ring in place, the latter is set in position before the hub is put in the press, and as the ram descends to shear the flash, it also pushes the ring into the hub. To make sure that the operator has both hands clear, he must operate the hydraulic valve with one hand and press a button controlling a valve interlock with the other.

Machinist's Lament

By HARVEY JACOBSON

The following verse was recited to me by one of the men in the shop, and I feel sure other men connected with the machine business will appreciate it as much as ***I did:***

The centers run out a foot and a half,
The belts are so frayed they will make you laugh,
The chuck is buried beneath the bench,
And the devil himself couldn't find the wrench.
You're all set to cut an eight pitch thread
And find you're cutting ten instead;
Then you realize your pals so true
Have moved the lever a notch or two.
No sooner are you well begun,
Then the boss walks in and asks if you're done.
And it's pretty hard to alibi,
When he looks at you with his fishy eye.
The drills cut big and the reamers small,
The tool bits don't stand up at all;
And although this business is full of grief,
I'd rather be here than on relief.

INDUSTRY ORGANIZES
For National Defense

ALERT to what is happening in Europe, the American people are setting out to strengthen their defenses against aggression from any quarter. Already the government has laid down an initial program to that end.

The surest defense against aggression is the ability to resist it. If we are known to be well prepared we may avert attack. If we cannot avert it we shall be armed against it. But preparedness against war means preparedness to wage war.

And modern war is an industry. Like every other industry, it is a matter of men, materials and machines. Fighting men must be skilled workers, trained to use an arsenal of special tools and equipment that are just as diversified and just as essential to success as those of any other industry.

The plant, supplies and personnel of war must rival in efficiency those of any peacetime industry. For the stakes of success or failure in war are not paid in money profits or losses: they are paid in the lives and property of the people, in the security — perhaps the survival — of a nation.

* * *

Sound national defense calls first for a comprehensive program, carefully planned to back up a clear-cut policy as to what we expect to defend. Next comes the appropriation of funds to realize that program. These first steps are vital: they are up to government.

Then program and appropriations must be translated into performance. Native raw materials must be produced, processed and stored. Our meager supplies of strategic materials of foreign origin must be built up until we have accumulated ample stockpiles against the use and wastage of active war. And most urgent, because it is most complicated, raw materials must be manufactured into the innumerable items required to equip the modern army.

We of McGraw-Hill, living with American industry as we do, are keenly aware of the effort that will be required to produce the materials and equipment now needed to modernize our national armament.

Tanks and anti-tank guns, airplanes and anti-aircraft guns, machine guns and automatic rifles, trucks and tractors, destroyers and supply ships — these are but a few items from the endless inventory of military and naval equipment that we must produce by scores, hundreds and thousands, even to arm an Initial Protective Force, behind which we might rally our national resources for decisive effort.

Obviously the army and navy must count on American industry for an ample and continuous supply of this equipment, and industry must organize to produce it in vast quantities. This means the construction and adaptation of manufacturing, transportation and storage facilities, the organization of competent executive and technical staffs, the training of skilled craftsmen in numbers adequate to maintain exacting production schedules. All this, in itself, is an industrial organization problem of the first magnitude, but upon it is imposed still another and vital specification— *sustained speed.*

For time is the all-essential ingredient of modern war. It cannot be bought with any appropriation, however great; once lost, it cannot be recaptured; we must make effective use of it while we still have it. And at this juncture we have none to waste in fumbling, jockeying or experiment.

* * *

Two courses are open to carry out such a program.

1. We might adopt the totalitarian plan of nationalizing industry, conscripting the wealth and labor of all, and suppressing the normal incentives and management of industry in favor of the authority and control of government officials.

2. Or we can stick to the American way of achieving national unity and efficiency by intelligent cooperation between industry, labor and government.

There are those to whom the first will appeal as being the more direct. But I am convinced that most Americans will insist that the job be done in the American way. And in this preference the President, speaking for government, already has indicated his concurrence.

But effective cooperation in so complex and unfamiliar a task demands the utmost of mutual understanding and confidence from all concerned. Confusion of purpose and conflict of opinion are bound to arise — have, indeed, already arisen. Needs and capacities in many fields must be reconciled, relative priorities for various products must be determined, specific parts of the whole program must be allocated, supervised and coordinated with other parts. Government officials, smarting under the whip of urgency, must render quick decisions on highly technical matters, while industrial executives, masters of their own operating technique, must adapt themselves to arbitrary and unfamiliar requirements.

Under such conditions, many problems will arise that must be worked out between the men of industry and those of government. Some of them will be the more acute because of the restrictions under which industry has had to work during recent years—restrictions that have curbed not only the expansion of plant capacity, but also the development of improved processes and the supply of skilled workers. Now, from this sag in our industrial growth, many departments of industry must undertake an overnight expansion of capacity to meet the exacting time schedules of national defense. So industry must look to government for the cooperation that will enable it to expand its facilities promptly and yet write off in reasonable time its heavy emergency investments.

* * *

If we are to deal wisely with these situations, and many more we cannot now foresee, everyone engaged in any part of the defense effort must be willing and able at all times to get a fair understanding of the problems of the others. To help maintain such an understanding McGraw-Hill is peculiarly fitted.

1. By the organized exchange of views and information among our 24 papers, we can help to coordinate the thinking and practice of the 1,000,000 executives, technicians and operating men who are their readers, in matters that have to do with their part in the defense project.

2. Through constant contact with government agencies and the men of industry, our papers can interpret to industry the needs and policies of government and to government the problems and requirements of industry.

3. For the men of industry, each of our papers will expand its regular service as a clearing house of technical and operating data, with special reference to the needs of plants that are producing defense materials and equipment.

To forward these objectives we have set up within our company a National Defense Editorial Board. It is composed of the chief editors of our publications that serve the functions and industries that are of key importance to the defense effort. Made up of men intimately familiar with the personnel and practice of their industries, this board will stimulate and supervise the activities of McGraw-Hill papers insofar as they can contribute to the defense effort. It will outline basic editorial themes, directed to the forwarding of that project, to be adapted by each paper to the special needs of its specific field.

The board will keep close touch with industrial executives and technicians so as to keep abreast of new problems as they arise. It will maintain contact also with government defense agencies and keep our editors posted as to government objectives, plans and problems. Thus it will function as a link between the several governmental defense agencies and the McGraw-Hill editorial organization, and so help each editorial staff to develop a program best suited to the special problems of its industry.

* * *

In thus undertaking our part in an extraordinary industrial effort, we shall not neglect the normal concerns of American industry. So far as may be consistent with the paramount needs of national defense, production and distribution of the goods and services normally consumed by the American people must go on. The effort to mobilize industry for the national defense must be, in large measure, an additional job and an added burden.

That burden is within the capacity of the American people. But it will not be light. And if industry is to carry successfully its heavy share of that burden, it needs the full cooperation of every industrial function.

For more than seventy-five years, through peace and war, McGraw-Hill publications have served to interpret between the various departments of industry and between industry and the American people. Today, as we face these new problems, there is a new and urgent need for interpretation between the industries we serve and the government to which we all bear allegiance. It is fitting that McGraw-Hill should undertake this effort. To it I pledge every resource of our organization.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

DIE DESIGN FOR LOW MAINTENANCE

When to use guide posts

BY JOSEPH I. KARASH, RELIANCE ELECTRIC & ENGINEERING COMPANY

Dies must be designed with an eye to first cost and production possibilities; but that's not the whole story. Die maintenance is important, too, if top efficiency is to be obtained

MOST TOOL AND DIES designers take little interest in die maintenance cost because they feel that it is purely a problem of having the best grinding equipment that die usage justifies. So far as the actual cutting time of the grinding wheel on the die is concerned, the designer is correct in assuming that die maintenance is merely a matter of providing equipment. However, an analysis will show that a large portion of the total time required to grind a die often is spent in dismantling, reassembling and adjusting. These elements of maintenance cost are much affected by the design of the die.

When laying out a die, the aim of the designer is to produce a tool of such mechanical construction that it will operate with high efficiency and will have a minimum initial cost. Granting that these two factors are of prime importance when judging the design of a die, there is a third factor which can be influenced to a large extent by the mechanical peculiarities of the design. This factor is the cost of setting up, sharpening and maintaining the die throughout its useful life.

Initial cost and speed of operation usually are easy to determine. They can be estimated before the die is built and can be determined exactly after the die has been completed. The cost of maintaining the die is more difficult to evaluate; as a result, die maintenance cost usually is accepted as an intangible about which little or nothing can be done by the designer.

Relative importance of die maintenance cost can be determined by comparing initial cost and total maintenance cost during the life of the die. This ratio will differ with each design, and will vary with operating conditions. The greater part of the total cost for maintaining a die can be assumed to be the product of the average cost of sharpening the die each time it becomes dull and the number of times the die will be sharpened before it is discarded. The cost of dismantling for grinding and reassembling after grinding must be added for each sharpening.

Ways and means of reducing the labor cost of dismantling, reassembling and adjusting are under the control of the die designer. The following theoretical examples illustrate certain fundamental principles in tool design which make it possible for the designer to hold the over-all cost of a die at a minimum. In order to eliminate details which might confuse the real issues involved, only plain piercing or blanking dies are used in these examples—compound dies and gang dies are avoided. It should be kept in mind that the variations and combinations of these basic principles are unlimited.

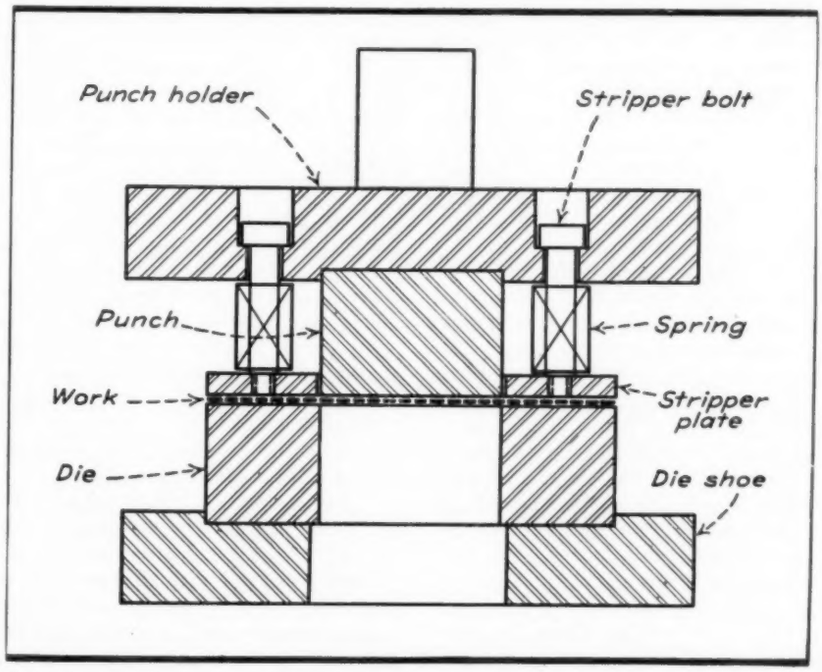


Fig. 1—Guide posts are necessary in a design of this type because the stripper mechanism prevents entering the punch in the die for alignment

Are Guide Posts Needed?

One of the first decisions to be made when designing a die is whether or not to use guide posts. It is possible in some cases to decrease the initial and the maintenance costs of a proposed die by omitting guide posts. Some designers always use guide posts as a matter of principle. There are conditions where guide posts should be used; but under certain other conditions they should not be incorporated in the design.

The method of attack which prob-

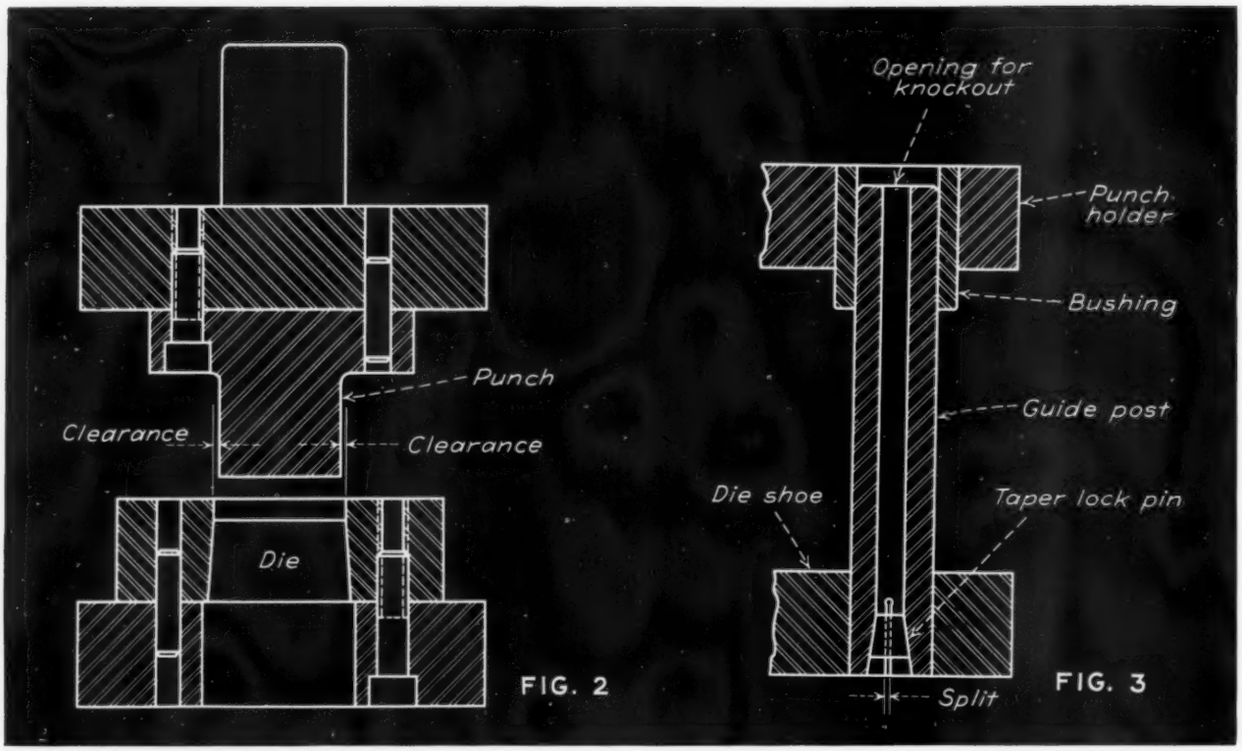


Fig. 2—The amount of clearance between the punch and the die determines accuracy of set-up when punch and die are used instead of guide posts for establishing alignment. Fig. 3—This is one of several available types of patented removable guide posts; such posts save much time when dismantling or reassembling for sharpening

ably will give the best results is for the designer to review and firmly fix in mind the answers to the questions: Why are guide posts used? What disadvantages can be incurred by using guide posts?

Guide posts are used to align the punch holder and the die shoe. The posts serve as guides, so that when the die is opened and closed the various members mounted in the die set will move in fixed relation to each other. The use of guide posts greatly facilitates the set-up of the die in the press by providing the fixed relation between the punch holder and the shoe. It should be noted that this advantage is realized only under certain conditions. There are times when a punch and die can be set up in a punch press without the use of guide posts, and without incurring any disadvantages.

As a general statement, it can be said that the use of guide posts is accepted as good design practice, however their use incurs some minor disadvantages which must be recognized. From the standpoint of die maintenance cost, the disadvantages of guide posts are:

1. The bushings have a tendency to jam on the posts, consequently dismantling and reassembling the die set is at best an awkward operation.

2. The guide posts themselves, in most cases, must be removed from the die shoe when the die is to be sharpened, and replaced after the grinding operation. This is particularly true if the die is to be sharpened in a rotary surface grinder.

3. When punching holes in sheet stock the use of guide posts makes necessary a die set large enough to permit the guide pins to clear the work. Use of a large die set increases maintenance cost because of increased handling time.

The disadvantages of guide posts from the standpoint of initial cost are:

1. The use of guide posts makes necessary a die set. If conditions permit the elimination of guide posts a savings sometimes can be realized by improvising a punch holder and die shoe from machine steel or boiler plate.

2. Since guide posts must clear the edges of the work, initial cost sometimes is increased because of the larger die set that must be used.

3. Guide posts increase the initial cost because the punch and die must be accurately mounted in relation to each other and to the guide posts. The precision mounting of these elements is an expensive operation.

In general, guide posts should not be used unless there are definite conditions which justify their use. The following paragraphs analyze some of the conditions which make guide posts necessary:

When setting up a punch and die without guide posts, the alignment is established by securing the punch holder to the ram, and the die shoe to the press bed, while the punch and die are in an engaged position. The fit of the punch in the die thus is used as the basis for alignment.

Some punches and dies cannot be set up in this manner, but must have guide posts to align them when setting up. Such a design is shown in Fig. 1. This is a simple piercing or blanking die with a spring operated stripping plate. It will be noted that the punch and die cannot be placed into the press in an engaged position because the stripping mechanism prevents the punch from entering the die. It is readily seen that guide posts are a necessity under such conditions.

The size of the punch holder may make it advisable to use guide posts, even though the mechanical characteristics of the design allow the punch to enter the die freely. Should the punch holder itself be too heavy to be handled without a crane, there is danger of chipping the cutting members as the punch and die are en-

gaged prior to placing the die-set into the punch press.

It should be noted that only the size of the punch holder is considered. The size of the die shoe is not a factor, since the punch and die are engaged before the die set is placed on the bolster of the press. The die shoe is not moved during the operation of engaging the punch in the die. After the punch and die have been engaged, the total weight of the die set has no effect on the question of guide posts.

In laying out the design, it should be kept in mind that the size of the punch holder is not a fixed value, for its dimensions also depend on whether or not guide posts are used.

For example, assume that a die is needed to punch a small hole in the center of a large piece of sheet metal. If guide posts are used the punch holder will have to be large enough to permit the posts to clear the edges of the work—in many cases this would make the punch holder too heavy to handle. If guide posts are not used, the punch holder sometimes can be made quite small—only large enough to hold the punch satisfactorily. The size of the die shoe would probably be nearly the same in either case, since the shoe must be large enough to provide guides and stops for the work.

Quality of the product oftimes is the reason for guide posts being necessary. The interpretation of quality in this case is the amount of burr that will be left on the edge of the punching. Every die will produce a certain amount of burr, and a dull die will show more burr than a sharp die. However, the primary cause for burr is the clearance between the punch and the die, as indicated in Fig. 2. This clearance is necessary because it greatly reduces the pressure required to pierce the work.

The clearance between punch and die is not a constant factor, but varies with the thickness of the work and the material being sheared. For punching thin steel sheet (approximately 0.015 in. thick), the clearance should be so small that the punch has practically a slip fit in the die. The clearance would be much larger for thicker material.

In setting up a punch and die without guide posts the alignment is established by securing the punch holder to the ram and the die shoe to the press bed while the punch and die are engaged. A punch and die made for use on thin material can be set up quite accurately by this method, since the punch has a close fit in the die.

With the punch and die fitted for operation on thicker material the punch is considerably smaller than the die. Consequently, if the fit of the punch in the die is used as a basis of registration the set-up will be no more accurate than the amount of clearance. It generally will be found that such a set-up will have most of the clearance on one side. This will cause the work to be pinched on one side and will cause an excessive burr on the opposite edge.

There is another factor which may affect the accuracy of a set-up without guide posts. When the punch press has been in use for a considerable period of time the ways may be badly worn and there may be a slight looseness in the ram. Under such conditions the accuracy of the set-up may be affected. This, however, generally may be considered as a negligible factor. It would be more practical to put the punch press into good operating condition than to accept a policy of using guide posts on all die designs.

Where it is deemed necessary to use guide posts, it is well to select a removable type. There are many types of patented removable guide posts on the market, a typical example is shown in Fig. 3. This guide post is equipped with a taper locking pin. Instead of having to use an arbor press to remove the guide posts, they can be removed easily by knocking out these tapered pins.

Take Care of Those V-Belts

By L. L. SMITH

Mechanical Engineer, Texrope Division, Allis-Chalmers Manufacturing Company

Common complaints of V-belt troubles indicate that certain simple rules are being neglected, resulting in loss of power and short belt life. Long and trouble-free service from the drives can be expected if the following points are observed:

1. *Buy the V-belt for the job.* General-purpose belts should not be used at temperatures exceeding 130 F. Special heat-resisting belts are satisfactory up to 200 F. Standard belts possess some resistance to oil, dilute acids and unusual atmospheres. However, longer life can be obtained under these conditions by installing special belts.

2. *Use a straight-edge* to obtain proper alignment of driving and driven shafts. These should be parallel, with the belts running exactly at right angles to the shafts. Any appreciable misalignment always causes undue wear.

3. *Provide some form of belt tension adjustment* in every V-belt drive installation. This can be accomplished by slide rails on the motor, an adjustable or pivoted motor base, or an idler arrangement. After the drive is properly lined up, enough tension should be applied to make the belts tight. The tight side of the drive should preferably be on top, although this is not absolutely necessary. V-belts stretch approximately ten per cent of their original length during their operating life. Enough adjustment should be provided to permit this amount of take-up.

4. *Inspect all V-belt drives periodically* to be sure that proper belt tension is being maintained.

5. *Always use matched sets of V-belts* for every installation. These permit each belt to carry its share of the load. Matching should be in accordance with allowable tolerances for the various sized belts. For Texrope this tolerance varies from zero on a 55-in. belt to 0.6 in. on a 660-in. belt.

6. *Replace V-belts in the following manner:* Remove all tension from the drive and get as much slack as possible on the belt, place a complete set of new belts on the sheaves, check the alignment of the drive and then apply the proper tension. Replacement should always be made with a complete set of new belts because it is difficult to match two or three new belts with several old belts which have been stretched. Old belts which are still good may be used for replacement in an emergency. Usually by the time this is necessary the new belts will have stretched enough to permit a fairly well matched drive.

7. *Never pry V-belts onto a sheave.* A bar, piece of pipe, or other object used for this purpose might rupture the belt cords and cause early failure.

8. *Store spare sets of V-belts in a cool, dry, dark space.* Heat, light and dampness cause the rubber to deteriorate and greatly shorten belt life.

9. *Never apply any belt dressing to any V-belt drive.* The principle of V-belt operation is the wedging action between the sides of the belt and the sheaves. Dressing may cause these surfaces to become slippery, allowing the drive to slip with a resulting loss of power. It may also shorten belt life by causing deterioration.

Magnetism measures hardness

BY R. C. GIBBONS, MILWAUKEE PLANT, INTERNATIONAL HARVESTER COMPANY

Why not a magnetic test to check hardness readings of high-speed steels? It results in accuracy without ambiguity

CHECKING high-speed steel tools after heat-treating by measuring the hardness, usually a Rockwell C measurement, is not completely satisfactory. Since the range of hardness is very narrow and since the hardness-temperature curve reverses itself twice, there can be some doubt as to the meaning of the hardness reading. To find a more satisfactory method, certain tests have been made and are reported below. They indicate good possibilities for a more sensitive check of the condition of high-speed steel tools.

The method is based on the fact that a high-speed steel on quenching retains considerable gamma iron, or austenite, which is not magnetic and which on being tempered at about 1,000 F. is transformed into alpha iron, or martensite, which is magnetic. The amount of magnetism of the tool depends largely upon the extent of this transformation. Although this can be determined by micro-examination of etched samples, such tests are not practical for routine inspection.

How Test Is Made

The magnetic tester used is a magnetized bar $\frac{1}{8}$ in. in diameter and $1\frac{1}{2}$ in. long suspended from the spring of a Joly balance, ordinarily used for specific gravity tests. In making the tests, contact is made between the magnet and sample, and the upper end of the spring raised until contact is broken. This height, measured on the scale, is in direct proportion to the magnetism of the sample. The scale vernier permits readings to 0.1 mm.

All samples for this test are taken from a $\frac{5}{8}$x$\frac{7}{8}$-in. bar of 18–4–1 high-speed steel. The bar is cut into four 10-in. lengths and each is quenched separately in oil. Before the secondary hardening treatment, sections $\frac{3}{8}$ in. thick are sliced off with a rubber cut-off wheel, care being taken to avoid burning, and these pieces tempered according to the table.

After tempering, the samples are ground smooth, finished with a fine-grain alundum wheel, measured for magnetism and checked for hardness. Both Rockwell C and Superficial Rockwell 45 N tests are made, but since the two hardness tests agree closely only the C readings are plotted on the chart. Four hardness tests are averaged to plot the curve.

Several magnetic tests are made on each sample. It has been found that eight tests on each side of the sample give an average that can be closely duplicated. The average of the sixteen tests is shown plotted against tempering temperature.

All samples are tempered 30 min.; but to determine the effect of repeated tempering, tests are also made on samples tempered two, three and four times at 1,000 F. for 30-min. periods.

INFLUENCE OF DRAW TEMPERATURE ON MAGNETIC PROPERTIES

Sample No.	Quenched From	Drawn At	Times	Rockwell C	Rockwell 45 N*	Magnetic Test
A1	2100	....	..	66.0	70.35	8.14
A2	"	500	1	63.1	67.85	9.12
A3	"	700	1	62.6	66.95	9.22
A4	"	900	1	63.6	68.15	10.50
A5	"	1000	1	64.2	68.75	10.36
A6	"	1050	1	64.7	68.85	10.64
A7	"	1100	1	65.1	69.55	11.63
A8	"	1200	1	63.3	65.75	12.17
A9	"	1000	2	65.1	68.95	10.22
A10	"	1000	3	65.2	69.05	11.00
A11	"	1000	4	65.3	68.70	11.63
B1	2200	....	..	66.5	70.65	8.35
B2	"	500	1	63.2	66.65	9.09
B3	"	700	1	63.1	66.25	9.12
B4	"	900	1	63.2	66.75	9.45
B5	"	1000	1	64.4	68.35	10.06
B6	"	1050	1	64.8	68.70	10.02
B7	"	1100	1	65.0	68.55	11.42
B8	"	1200	1	61.9	65.45	11.96
B9	"	1000	2	64.2	67.95	10.87
B10	"	1000	3	64.0	68.15	10.60
B11	"	1000	4	63.9	67.55	11.18
C1	2300	....	..	66.1	70.25	8.10
C2	"	500	1	63.0	66.00	8.84
C3	"	700	1	62.8	65.85	8.85
C4	"	900	1	63.2	66.40	9.23
C5	"	1000	1	63.9	68.15	10.58
C6	"	1050	1	64.3	67.35	10.29
C7	"	1100	1	64.4	67.70	10.90
C8	"	1200	1	62.0	64 60	12.84
C9	"	1000	2	64.4	67.75	10.88
C10	"	1000	3	63.7	67 40	11.46
C11	"	1000	4	64 2	67.30	11.89
D1	2400	....	..	67.0	70.75	8.46
D2	"	500	1	64.2	67.10	8.55
D3	"	700	1	63.6	66.70	8.77
D4	"	900	1	63.6	67.40	9.96
D5	"	1000	1	65.3	68.65	9.91
D6	"	1050	1	65.2	68.65	9.96
D7	"	1100	1	65.5	68.70	10.13
D8	"	1200	1	63.0	66.05	11.11
D9	"	1000	2	65.6	68.50	10.70
D10	"	1000	3	65.5	68.55	10.96
D11	"	1000	4	65.5	69.00	11.88

*Uncorrected. All Superficial readings are about 2½ points low.

A Joly balance normally used to check specific gravity is the only instrument used in these tests to measure magnetic properties

The change in magnetism is shown on the graph.

The results show that hardness measurements follow the usual curve, starting at a high figure for the untempered samples, dropping to a low when tempered at 700–900 F., rising again in the 1,000–1,100 range, and dropping off at 1,200. Repeated tempering produces negligible changes.

Unexplained Dip

Magnetic tests show that the magnetism of untempered samples is low and that the change is slight until the temperature exceeds 700 F., after which it rises rapidly. All four series show a dip in the curve at about 1,000 F., which has not yet been satisfactorily explained. Samples that have been given more than one tempering treatment show increase in magnetism in ten out of the twelve steps.

The results show definitely that the rate of change in magnetism, increasing as it does over a 50 per cent range, offers an excellent method of measuring the degree of tempering of high-speed steel tools. It offers the advantages of:

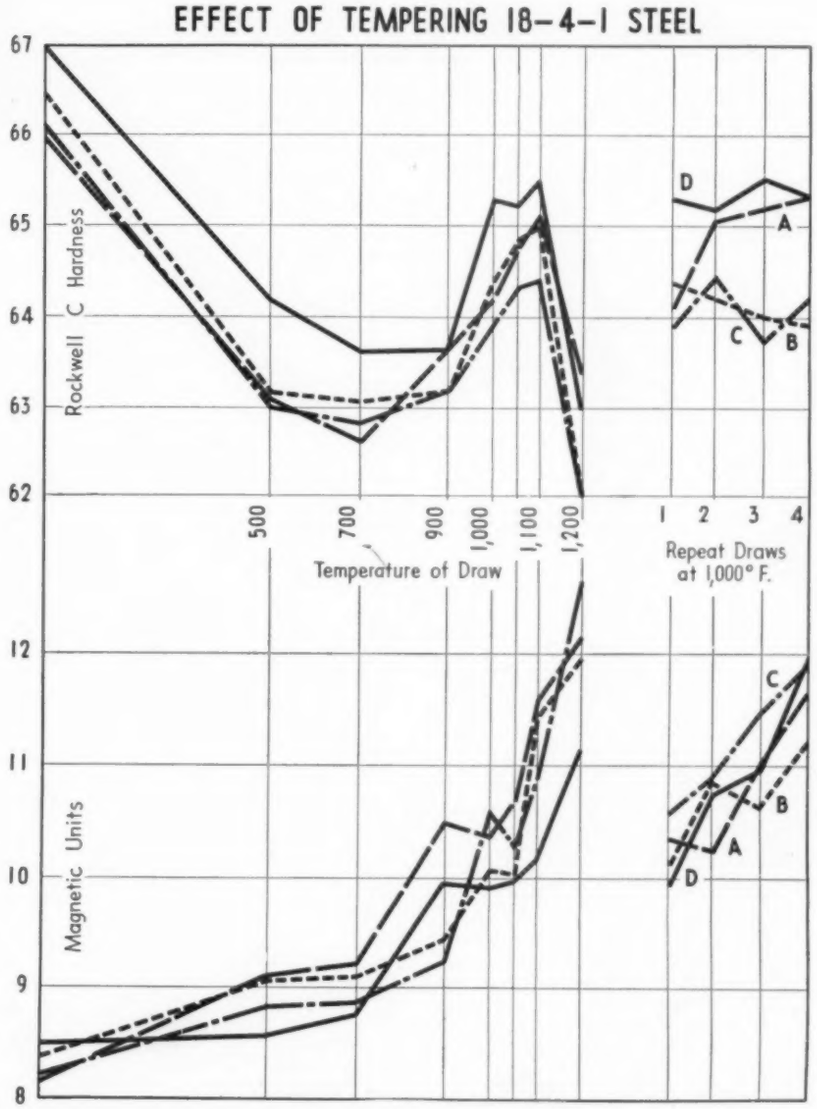
1. *Sensitivity.* Rockwell C measurements can be read only to about ½ point, and the range shown on the curve is a five-point range, or only 10 times sensitivity. Magnetic measurements are read easily to less than 1 mm., and the range covered by the curves is 40 mm., or more than 40 times the accuracy limit.

2. *Wide range.* Rockwell C readings cover only 5 points, which at 60 Rockwell C is only a 12 per cent range. Magnetic readings cover a 50 per cent range.

3. *No ambiguity.* Rockwell C readings mean little at certain points, as the curve reverses itself twice in the tempering ranges. The magnetic curve, except for a minor dip, is a straight-line curve.

It is not meant that magnetic tests should displace hardness tests, only that they should supplant them. There are still two disadvantages of magnetic tests that may cause trouble. One is the fact that so far all results are merely empirical, and standards must be set up for comparison. The other is that different tool steel analyses give somewhat different readings. It has been found, for instance, that nitrided tool steel gives high readings, even with considerable austenite.

It would seem, therefore, that magnetic testing could be developed to the point where it would be a valuable inspection method in tool hardening departments. In several cases, tools giving poor life have been found to have low magnetism, and microexamination nearly always shows that they have been insufficiently tempered. This type of mistake could be completely eliminated by magnetic inspection.



Magnetism of high-speed steels changes steadily with increase in temperature of draw, whereas the hardness curve reverses direction

IDEAS FROM PRACTICAL MEN

Square Holes Produced by Milling and Welding

By F. J. WILHELM

The methods described in this article are suggested for making boring bars, boring heads and toolholders in small lots where the quantity would not warrant the cost of making broaches for broaching the square holes for the toolbits, and are not intended to apply to quantity production.

Referring to Fig. 1, the simple one-hole toolblock *A* is shown for illustration purposes only. The slot for the toolbit is milled and the cover plate *B* is welded on. The weld is subject to stress of considerable leverage when the screw is tightened on the toolbit, as indicated by the dotted lines and the directional arrow. If a series of holes are necessary to accommodate several toolbits, as in some toolblocks, the cover plate would have to be larger, thus increasing the welded inches and the stress on the weld.

A better construction is shown at *C*. The slot is milled considerably deeper and the filler piece *D* is welded in the upper part of the slot, leaving a square hole for the toolbit, the welding metal being deposited on the top and at both ends. Two edges of the filler piece are chamfered at an angle of 45 deg. and it is 0.002 in. wider than the width of the slot for a press fit. When pressed into the slot, the chamfered edges being uppermost provide troughs for the welding metal. The binding screw for the toolbit is in a tapped hole in the filler piece and no cover plate is needed.

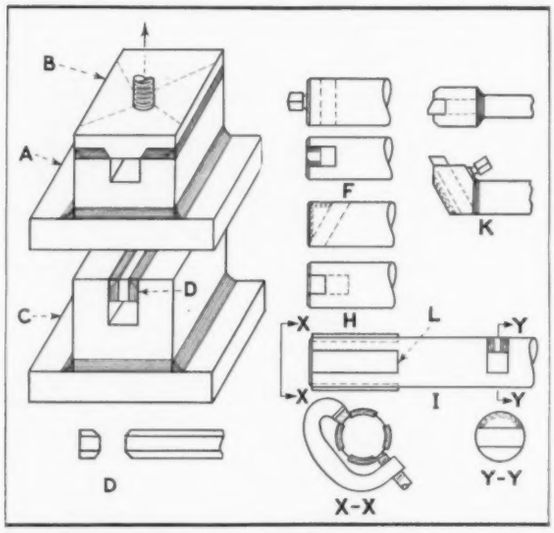


Fig. 1—Instead of broaching the square holes for tool bits in boring bars and toolholders, they can be made by milling slots and welding in filler pieces. The latter are press-fitted prior to welding

The square holes for toolbits in the boring bars *F*, *H* and *I* and the toolholder *K* in Fig. 1, and the boring head in Fig. 2 all have filler pieces *D* welded in milled slots.

Where the cutter follows the pilot, as in the boring bar *I*, Fig. 1, the pilot is made by welding four segments *L* in milled seats and the segments are hard surfaced by the electric arc. When the pilot is ground to size, the edges of the segments are left sharp to scrape up the chips and prevent them from being lapped in the wall of the hole being bored, for which reason a pilot of this type is superior to a solid one.

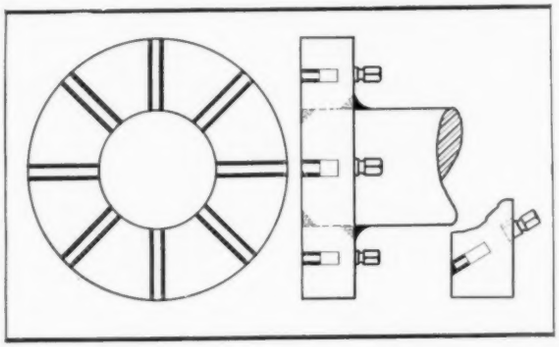


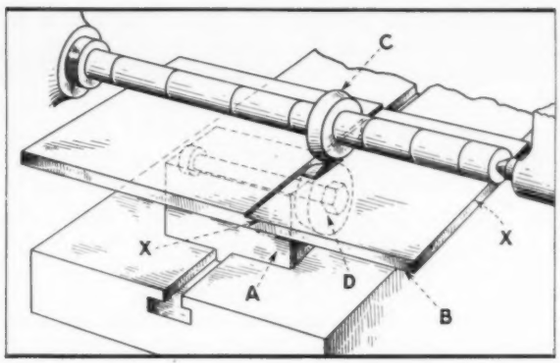
Fig. 2—The boring head is welded to the bar. The square holes for the toolbits are made in the same way as those in the boring bars and the toolholder, that is, with welded-in filler pieces

Shearing Attachment for the Milling Machine

By CHARLES HOMEWOOD

Among the machine tools that make up the equipment of a general machine shop, the milling machine probably ranks first in ability to perform the most varied operations. In it work can be milled, slotted, turned, drilled and bored, but its use as a shear is, I believe, not generally known. However, the attachment illustrated will give a general idea of how the machine can easily be converted into a rotary shear for light work.

Essentially, the attachment consists of the cast-iron block *A*; the steel plate *B*; on which the stock to be sheared rests; and the upper and lower cutters *C* and *D*, cutter *C* being mounted on the cutter arbor. The base of block *A* has a tongue to fit the slot in the machine table and the block is bored to form a bearing for the shaft on which the lower cutter is mounted. Plate *B* is attached to the top of the block and is cut



With this simple attachment mounted on the milling machine table, stock 1/32 in. thick can be sheared without strain on the arbor, adding one more operation to the machine's versatile use

out in the center to clear the lower cutter, the part *X* being $\frac{1}{16}$ in. lower than the cutting edge of th elower cutter. The cutting face of the lower cutter is ground to an angle of 5 deg., while that of the upper cutter is 10 deg., both cutters being approximately the same diameter at the cutting edges.

While the machine equipped with the attachment is not intended to compete with a regular rotary shear, it will cut the cost of many a job requiring small plates and strips of sheet metal. Stock $\frac{1}{32}$ in. thick can be sheared in the average small milling machine without undue strain on the cutter arbor.

A Die that Pierces Three Holes and Cuts the Stock

By WILLIAM B. GREENER

The illustrated die pierces three holes and cuts off the piece all at the same time. The stock is 0.0625 in. thick and 20 in. wide. The piece is 20 in. long and 1½ in. wide.

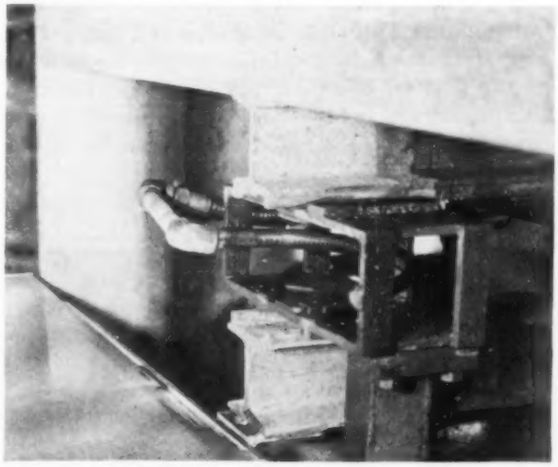
The die consists of a punch holder *A* and a die shoe *B*. The die block *C* is screwed and doweled in place on the die shoe *B*. Similarly the cutoff block *D* is attached in place on the punch holder *A*. The piercing punches *F* and *M* are held in place on the punch holder by the inserts *E* and *N*. A stripper *H* is screwed and doweled in place on the die block *C*. Two liner pins *L*, and two bushings *K* are provided in proper location. Two stock supports *J* are welded to the die block *C*. Two stock stops *P* locate the stock in correct position.

In operation the stock is fed through the stripper up to the cutoff edge of the die and then the first piece is pierced. The stock is then moved along until it locates on the stock stops *P*. The second piece is then pierced and the first piece is cut off at the same time. As the piece falls it slides out of the back of the die on the angular cut out.

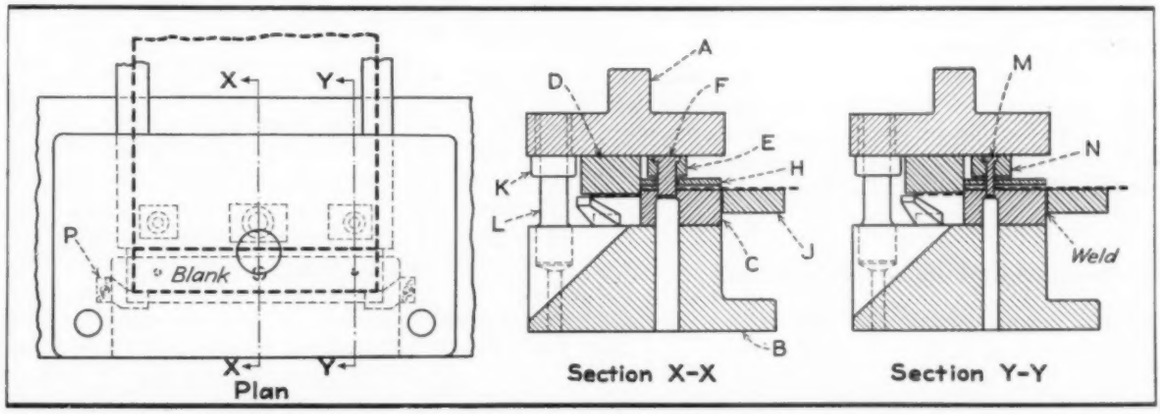
One Method of Quenching Curved Dies

By FRED H. COLVIN

Having a number of curved forming dies for tube bending to harden, it was found that dipping in the usual quenching tank did not give satisfactorily uni-



This perforated bent tube is used for spraying water on curved forming dies when they cannot be hardened satisfactorily by dipping in the usual quenching tank. The framework surrounding the curved tube supports the die against the water jet



This die pierces three holes in the stock and cuts it off simultaneously. The first piece moves to the stock stop and as the second piece is pierced the first piece is cut off and slides out back of the die

form results on the face of the die. To secure uniform cooling, the device illustrated was made. It is welded to the beams shown so as to bring it in a convenient position at the top of the quenching tank. Cooling water is forced through perforations in the curved tube, spraying the entire working surface of the die simultaneously, thereby securing uniform cooling. The framework surrounding this curved tube is designed to support the die in correct relation to the cooling jet, and has made it possible to handle work of this kind satisfactorily, both as to quality and quantity.

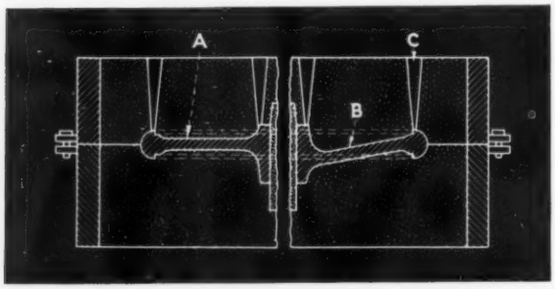
A construction of this kind can easily be modified to suit varying conditions where the surfaces to be hardened cannot be easily reached by ordinary quenching methods.

Pattern Changes Cuts Grinding Costs

By EMIL WITTANN

The webbed handwheel, one-half of the mold for which is shown at the left of the vertical center line in the illustration, had to be sandblasted, snagged on a grinding wheel and pickled to prepare it for nickel plating all over Usually it took the grinder considerable time to spot out the defects in the web that were caused by entrapped air at *A* in the mold during the process of casting.

The pattern was altered so that the web was at an



Entrapped air in the mold for this handwheel was eliminated by altering the pattern so that the web was at an angle, giving the air a chance to escape

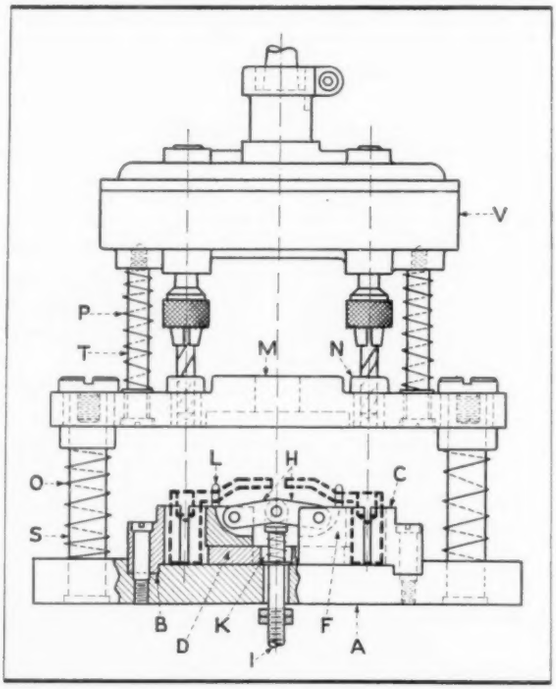
angle to the horizontal, as shown at *B* in the half of the mold at the right of the vertical center line. The air now had a chance to rise along the angular web and escape through the vent *C*, resulting in a smoother web that required much less time in grinding. Changes in other patterns resulted in similar savings.

Combination Drill Jig and Drilling Head

By JOHN A. HONEGGER

Illustrated is a combination drill jig and drilling head that was designed for drilling the hubs of two offset levers at the same time and with the least lost time for loading and unloading.

Essentially the assembly consists of the base plate *A* which is slotted at *B* for the stationary V-blocks *C*; the dovetailed guide blocks *D* for the sliding V-blocks *F*; the toggle links *H* which are connected to the sliding V-blocks and are operated by the rod *I*; the spring *K* to keep rod *I* in its upward position when pressure is released from a pedal (not shown); the pins *L* for locating the offset portions of the work; the bushing plate *M*; the drill bushings *N*; the springs *O* and *P*; the leader pins *S*; the studs *T*; and the



The work is clamped between stationary and sliding V-blocks, the latter being operated by toggle links actuated by a vertical rod connected to a foot pedal; springs move the drill head upward

drilling head *V* which is of the conventional type, the drills being driven by gears from the drill-press spindle.

In operation, the work, indicated by heavy dotted lines, is placed in the jig with the hubs between the stationary and sliding V-blocks and the pedal is depressed, causing the toggle links to move the sliding V-blocks and clamp the work. Springs *O* being somewhat weaker than springs *P*, they are compressed first and bring the bushing plate into contact with the work when the drill-press spindle is lowered. Further downward movement of the spindle compresses springs *P* as the drills enter the bushings and commence drilling. Drilling continues until a stop collar on the spindle prevents further downward movement. After drilling has been completed, the drill-press spindle is raised and the drilling head and the bushing plate are returned to the starting position by the springs. Pressure on the pedal is then released, unclamping the work. The jig is then unloaded and reloaded, after which the operation is repeated.

Involute-Spline Standards—I

Courtesy of the American Standards Association

THE STANDARDS for side-bearing involute splines are intended to serve as a basis for the design of interchangeable spline shafts and fittings. More or less deviation from the standard will be necessary to meet conditions imposed by engineering or production requirements. These standards were developed by the Sectional Committee on the Standardization of Small Tools and Machine Tool Elements, which is sponsored by the National Machine Tool Builders' Association, the S.A.E., and the A.S.M.E.

To minimize the requirements for

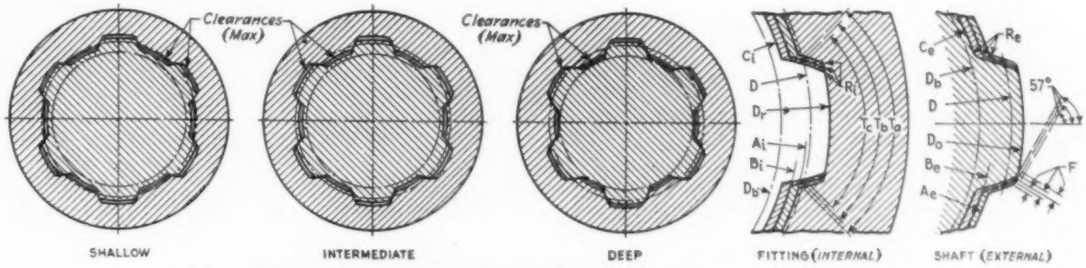


Table 1 Dimensions of 30 Deg Involute Spline With 6 Teeth—Fitting (Internal)

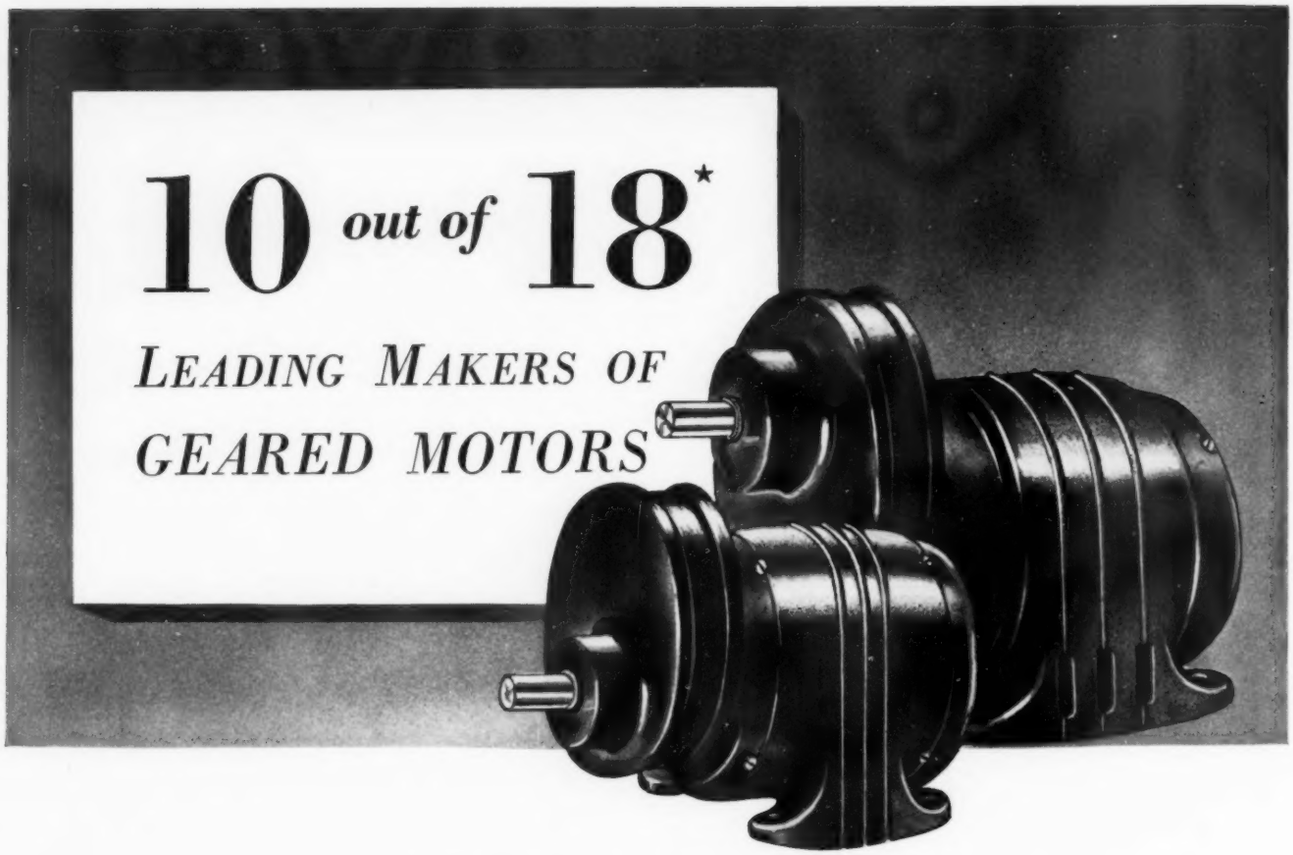
Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Root Diameter		Inside Diameters						Radius or Broach Chamfer		Circular Width of Space at the Pitch Line		
							Shallow		Intermediate		Deep				Shallow	Intermediate	Deep
				D_b	D_r		A		B_i		C_i		R_i		T_a	T_b	T_c
Bearing Number	Bore in Mm	D		D × 0.8660254	1.085D Max	1.070D Min	0.980D Max	0.979D Min	0.950D Max	0.949D Min	0.920D Max	0.919D Min	0.0233D Max	Nil Min	D × 0.270649	D × 0.261799	D × 0.253340
04	20	0 7500	8 0000	0 64952	0 814	0 803	0 735	0 734	0 713	0 712	0 690	0 689	0 017	0 000	0 2030	0 1963	0 1900
05	25	0 9375	6 4000	0 81190	1 017	1 003	0 919	0 918	0 891	0 890	0 863	0 862	0 022	0 000	0 2537	0 2454	0 2375
06	30	1 1250	5 3333	0 97428	1 221	1 204	1 102	1 101	1 069	1 068	1 035	1 034	0 026	0 000	0 3045	0 2945	0 2850
07	35	1 3125	4 5714	1 13666	1 424	1 404	1 286	1 285	1 247	1 246	1 207	1 206	0 031	0 000	0 3552	0 3436	0 3325
08	40	1 5000	4 0000	1 29904	1 628	1 605	1 470	1 469	1 425	1 424	1 380	1 379	0 035	0 000	0 4060	0 3927	0 3800
09	45	1 6875	3 5556	1 46142	1 831	1 805	1 654	1 652	1 603	1 601	1 553	1 551	0 039	0 000	0 4567	0 4418	0 4275
10	50	1 8750	3 2000	1 62380	2 034	2 006	1 838	1 836	1 781	1 779	1 725	1 723	0 044	0 000	0 5075	0 4909	0 4750
11	55	2 0625	2 9091	1 78618	2 238	2 207	2 021	2 019	1 959	1 957	1 897	1 895	0 048	0 000	0 5582	0 5400	0 5225
12	60	2 2500	2 6667	1 94856	2 441	2 408	2 205	2 203	2 137	2 135	2 070	2 068	0 052	0 000	0 6090	0 5890	0 5700
13	65	2 4375	2 4615	2 11094	2 645	2 608	2 389	2 386	2 316	2 313	2 243	2 240	0 057	0 000	0 6597	0 6381	0 6175
14	70	2 6250	2 2857	2 27332	2 848	2 809	2 573	2 570	2 494	2 491	2 415	2 412	0 061	0 000	0 7105	0 6872	0 6650
15	75	2 8125	2 1333	2 43570	3 052	3 009	2 756	2 753	2 672	2 669	2 588	2 585	0 065	0 000	0 7612	0 7363	0 7125
16	80	3 0000	2 0000	2 59808	3 255	3 210	2 940	2 937	2 850	2 847	2 760	2 757	0 070	0 000	0 8119	0 7854	0 7600
17	85	3 1875	1 8824	2 76046	3 458	3 410	3 124	3 121	3 028	3 025	2 932	2 929	0 074	0 000	0 8627	0 8345	0 8075
18	90	3 3750	1 7778	2 92284	3 662	3 611	3 308	3 304	3 206	3 203	3 105	3 101	0 079	0 000	0 9134	0 8836	0 8550
19	95	3 5625	1 6842	3 08522	3 865	3 812	3 491	3 487	3 384	3 380	3 278	3 274	0 083	0 000	0 9642	0 9327	0 9025
20	100	3 7500	1 6000	3 24760	4 069	4 013	3 675	3 671	3 563	3 559	3 450	3 446	0 087	0 000	1 0149	0 9817	0 9500
21	105	3 9375	1 5238	3 40998	4 272	4 213	3 859	3 855	3 741	3 737	3 623	3 619	0 092	0 000	1 0657	1 0308	0 9975
22	110	4 1250	1 4545	3 57235	4 476	4 414	4 042	4 038	3 919	3 915	3 795	3 791	0 096	0 000	1 1164	1 0799	1 0450

All dimensions are given in inches.

Table 2 Dimensions of 30 Deg Involute Spline With 6 Teeth—Shaft (External)

Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Outside Diameter		Root Diameters						Radius		Chamfer or Broken Edge		Minimum Recommended Major Diam of Involute Profile
							Shallow		Intermediate		Deep						
				D_b	D_o		A_o		B_o		C_o		R_o		F		
Bearing Number	Bore in Mm	D		D × 0.8660254	Max	Min	0.950D Max	0.940D Min	0.920D Max	0.910D Min	0.890D Max	0.880D Min	0.0163D Max	0.0054D Min	0.010D Max	Nil Min	
04	20	0 7500	8 0000	0 64952	0 7876	0 783	0 713	0 705	0 690	0 683	0 668	0 660	0 012	0 004	0 008	0 000	0 777
05	25	0 9375	6 4000	0 81190	0 9845	0 980	0 891	0 881	0 863	0 853	0 834	0 825	0 015	0 005	0 009	0 000	0 966
06	30	1 1250	5 3333	0 97428	1 1813	1 176	1 069	1 058	1 035	1 024	1 001	0 990	0 018	0 006	0 011	0 000	1 160
07	35	1 3125	4 5714	1 13666	1 3783	1 373	1 247	1 234	1 207	1 194	1 168	1 155	0 021	0 007	0 013	0 000	1 355
08	40	1 5000	4 0000	1 29904	1 5751	1 570	1 425	1 410	1 380	1 365	1 335	1 320	0 025	0 008	0 015	0 000	1 549
09	45	1 6875	3 5556	1 46142	1 7720	1 767	1 603	1 586	1 553	1 536	1 502	1 485	0 028	0 009	0 017	0 000	1 743
10	50	1 8750	3 2000	1 62380	1 9688	1 964	1 781	1 763	1 725	1 706	1 669	1 650	0 031	0 010	0 019	0 000	1 937
11	55	2 0625	2 9091	1 78618	2 1658	2 161	1 959	1 939	1 897	1 877	1 836	1 815	0 034	0 011	0 021	0 000	2 132
12	60	2 2500	2 6667	1 94856	2 3626	2 358	2 137	2 115	2 070	2 048	2 003	1 980	0 037	0 012	0 023	0 000	2 326
13	65	2 4375	2 4615	2 11094	2 5595	2 555	2 316	2 291	2 243	2 218	2 169	2 145	0 040	0 013	0 024	0 000	2 520
14	70	2 6250	2 2857	2 27332	2 7563	2 751	2 494	2 468	2 415	2 389	2 336	2 310	0 043	0 014	0 026	0 000	2 714
15	75	2 8125	2 1333	2 43570	2 9532	2 948	2 672	2 644	2 588	2 559	2 503	2 475	0 046	0 015	0 028	0 000	2 908
16	80	3 0000	2 0000	2 59808	3 1500	3 145	2 850	2 820	2 760	2 730	2 670	2 640	0 049	0 016	0 030	0 000	3 103
17	85	3 1875	1 8824	2 76046	3 3469	3 342	3 028	2 996	2 932	2 901	2 837	2 805	0 052	0 017	0 032	0 000	3 297
18	90	3 3750	1 7778	2 92284	3 5437	3 539	3 206	3 173	3 105	3 071	3 004	2 970	0 055	0 018	0 034	0 000	3 491
19	95	3 5625	1 6842	3 08522	3 7406	3 736	3 384	3 349	3 278	3 242	3 171	3 135	0 058	0 019	0 036	0 000	3 685
20	100	3 7500	1 6000	3 24760	3 9374	3 932	3 563	3 525	3 450	3 413	3 338	3 300	0 061	0 020	0 038	0 000	3 879
21	105	3 9375	1 5238	3 40998	4 1343	4 129	3 741	3 701	3 623	3 583	3 504	3 465	0 064	0 021	0 039	0 000	4 074
22	110	4 1250	1 4545	3 57235	4 3311	4 326	3 919	3 878	3 795	3 754	3 671	3 630	0 067	0 022	0 041	0 000	4 269

All dimensions are given in inches.



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Involute-Spline Standards—I

specials, the standard provides an option of three depths in each of five series covering 6, 10, 24, and 36 tooth splines.

On the 6, 10, and 16 splines, the S.A.E. straight-side spline depths for deep intermediate, and shallow have been incorporated in the involute standard. On the 24 and 36 splines, these depths are decreased by the inherent character of involute geometry.

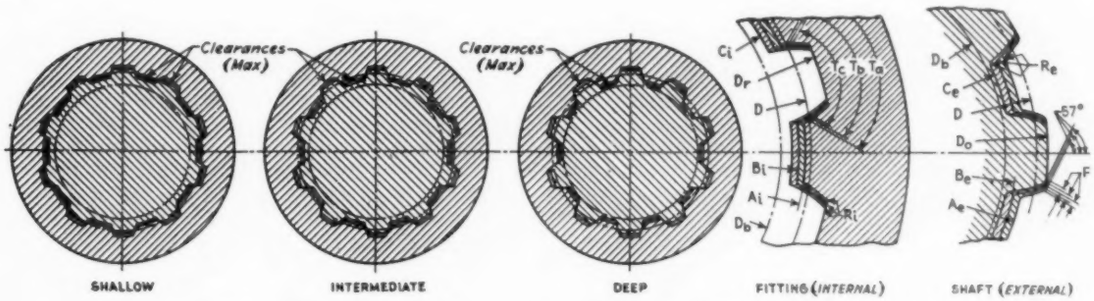

Table 3 Dimensions of 30 Deg Involute Spline With 10 Teeth—Fitting (Internal)

Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Root Diameter		Inside Diameters: Shallow		Inside Diameters: Intermediate		Inside Diameters: Deep		Radius or Broach Chamfer		Circular Width of Space at the Pitch Line: Shallow	Circular Width of Space at the Pitch Line: Intermediate	Circular Width of Space at the Pitch Line: Deep
				D_b	D_r		A_i		B_i		C_i		R_i		T_a	T_b	T_c
					1.085D	1.070D	0.980D	0.979D	0.950D	0.949D	0.920D	0.919D	0.0233D	Nil			
Bearing Number	Bore in Mm	D		D × 0.8660254	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	D × 0.165929	D × 0.157080	D × 0.148620
04	20	0.7500	13.3333	0.64952	0.814	0.803	0.735	0.734	0.713	0.712	0.690	0.689	0.017	0.000	0.1244	0.1178	0.1115
05	25	0.9375	10.6667	0.81190	1.017	1.003	0.919	0.918	0.891	0.890	0.863	0.862	0.022	0.000	0.1556	0.1473	0.1393
06	30	1.1250	8.8889	0.97428	1.221	1.204	1.102	1.101	1.069	1.068	1.035	1.034	0.026	0.000	0.1867	0.1767	0.1672
07	35	1.3125	7.6190	1.13666	1.424	1.404	1.286	1.285	1.247	1.246	1.207	1.206	0.031	0.000	0.2178	0.2062	0.1951
08	40	1.5000	6.6667	1.29904	1.628	1.605	1.470	1.469	1.425	1.424	1.380	1.379	0.035	0.000	0.2489	0.2356	0.2229
09	45	1.6875	5.9259	1.46142	1.831	1.805	1.654	1.652	1.603	1.601	1.553	1.551	0.039	0.000	0.2800	0.2651	0.2508
10	50	1.8750	5.3333	1.62380	2.034	2.006	1.838	1.836	1.781	1.779	1.725	1.723	0.044	0.000	0.3111	0.2945	0.2787
11	55	2.0625	4.8485	1.78618	2.238	2.207	2.021	2.019	1.959	1.957	1.897	1.895	0.048	0.000	0.3422	0.3240	0.3065
12	60	2.2500	4.4444	1.94856	2.441	2.408	2.205	2.203	2.137	2.135	2.070	2.068	0.052	0.000	0.3733	0.3534	0.3344
13	65	2.4375	4.1026	2.11094	2.645	2.608	2.389	2.386	2.316	2.313	2.243	2.240	0.057	0.000	0.4045	0.3829	0.3623
14	70	2.6250	3.8095	2.27332	2.848	2.809	2.573	2.570	2.494	2.491	2.415	2.412	0.061	0.000	0.4356	0.4123	0.3901
15	75	2.8125	3.5556	2.43570	3.052	3.009	2.756	2.753	2.672	2.669	2.588	2.585	0.065	0.000	0.4667	0.4418	0.4180
16	80	3.0000	3.3333	2.59808	3.255	3.210	2.940	2.937	2.850	2.847	2.760	2.757	0.070	0.000	0.4978	0.4712	0.4459
17	85	3.1875	3.1373	2.76046	3.458	3.410	3.124	3.121	3.028	3.025	2.932	2.929	0.074	0.000	0.5289	0.5007	0.4737
18	90	3.3750	2.9630	2.92284	3.662	3.611	3.308	3.304	3.206	3.203	3.105	3.101	0.079	0.000	0.5600	0.5301	0.5016
19	95	3.5625	2.8070	3.08522	3.865	3.812	3.491	3.487	3.384	3.380	3.278	3.274	0.083	0.000	0.5911	0.5596	0.5295
20	100	3.7500	2.6667	3.24760	4.069	4.013	3.675	3.671	3.563	3.559	3.450	3.446	0.087	0.000	0.6222	0.5890	0.5573
21	105	3.9375	2.5397	3.40998	4.272	4.213	3.859	3.855	3.741	3.737	3.623	3.619	0.092	0.000	0.6533	0.6185	0.5852
22	110	4.1250	2.4242	3.57235	4.476	4.414	4.042	4.038	3.919	3.915	3.795	3.791	0.096	0.000	0.6845	0.6480	0.6131

All dimensions are given in inches.

Table 4 Dimensions of 30 Deg Involute Splines With 10 Teeth—Shaft (External)

Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Outside Diameter		Root Diameters: Shallow		Root Diameters: Intermediate		Root Diameters: Deep		Radius		Chamfer or Broken Edge		Minimum Recommended Major Diam of Involute Profile
				D_b	D_o		A_e		B_e		C_e		R_e		F		
							0.950D	0.940D	0.920D	0.910D	0.890D	0.880D	0.0163D	0.0054D	0.010D	Nil	
Bearing Number	Bore in Mm	D		D × 0.8660254	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
04	20	0.7500	13.3333	0.64952	0.7876	0.783	0.713	0.705	0.690	0.683	0.668	0.660	0.012	0.004	0.008	0.000	0.777
05	25	0.9375	10.6667	0.81190	0.9845	0.980	0.891	0.881	0.863	0.853	0.834	0.825	0.015	0.005	0.009	0.000	0.966
06	30	1.1250	8.8889	0.97428	1.1813	1.176	1.069	1.058	1.035	1.024	1.001	0.990	0.018	0.006	0.011	0.000	1.160
07	35	1.3125	7.6190	1.13666	1.3783	1.373	1.247	1.234	1.207	1.194	1.168	1.155	0.021	0.007	0.013	0.000	1.355
08	40	1.5000	6.6667	1.29904	1.5751	1.570	1.425	1.410	1.380	1.365	1.335	1.320	0.025	0.008	0.015	0.000	1.549
09	45	1.6875	5.9259	1.46142	1.7720	1.767	1.603	1.586	1.553	1.536	1.502	1.485	0.028	0.009	0.017	0.000	1.743
10	50	1.8750	5.3333	1.62380	1.9688	1.964	1.781	1.763	1.725	1.706	1.669	1.650	0.031	0.010	0.019	0.000	1.937
11	55	2.0625	4.8485	1.78618	2.1658	2.161	1.959	1.939	1.897	1.877	1.836	1.815	0.034	0.011	0.021	0.000	2.132
12	60	2.2500	4.4444	1.94856	2.3626	2.358	2.137	2.115	2.070	2.048	2.003	1.980	0.037	0.012	0.023	0.000	2.326
13	65	2.4375	4.1026	2.11094	2.5595	2.555	2.316	2.291	2.243	2.218	2.169	2.145	0.040	0.013	0.024	0.000	2.520
14	70	2.6250	3.8095	2.27332	2.7563	2.751	2.494	2.468	2.415	2.389	2.336	2.310	0.043	0.014	0.026	0.000	2.714
15	75	2.8125	3.5556	2.43570	2.9532	2.948	2.672	2.644	2.588	2.559	2.503	2.475	0.046	0.015	0.028	0.000	2.908
16	80	3.0000	3.3333	2.59808	3.1500	3.145	2.850	2.820	2.760	2.730	2.670	2.640	0.049	0.016	0.030	0.000	3.103
17	85	3.1875	3.1373	2.76046	3.3469	3.342	3.028	2.996	2.932	2.901	2.837	2.805	0.052	0.017	0.032	0.000	3.297
18	90	3.3750	2.9630	2.92284	3.5437	3.539	3.206	3.173	3.105	3.071	3.004	2.970	0.055	0.018	0.034	0.000	3.491
19	95	3.5625	2.8070	3.08522	3.7406	3.736	3.384	3.349	3.278	3.242	3.171	3.135	0.058	0.019	0.036	0.000	3.685
20	100	3.7500	2.6667	3.24760	3.9374	3.932	3.563	3.525	3.450	3.413	3.338	3.300	0.061	0.020	0.038	0.000	3.879
21	105	3.9375	2.5397	3.40998	4.1343	4.129	3.741	3.701	3.623	3.583	3.504	3.465	0.064	0.021	0.039	0.000	4.074
22	110	4.1250	2.4242	3.57235	4.3311	4.326	3.919	3.878	3.795	3.754	3.671	3.630	0.067	0.022	0.041	0.000	4.269

All dimensions are given in inches.

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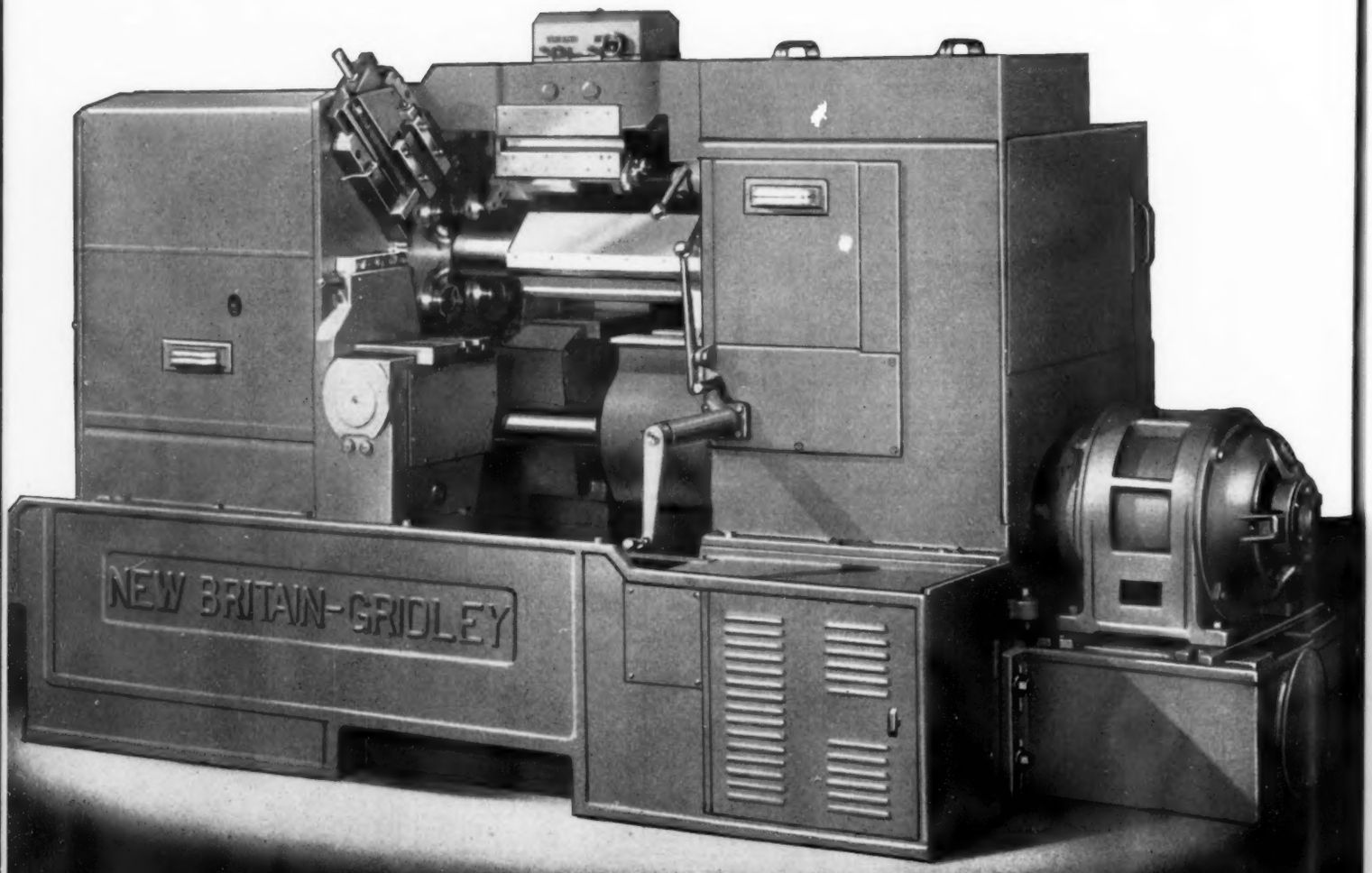

A complete line of Screw Machines — Four and Six Spindles to 2¼" Capacity
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Resolved: To Meet This Emergency

Now that Americans are thoroughly aroused by the might of foreign military power, an unprecedented peacetime armament program has been started. Time is the essence of its success. Every twenty-four hours will count.

With that inerasable fact in mind, we suggest the following set of resolutions:

BE IT RESOLVED:

That industry be given a free hand, without political interference and with a minimum of government control, to produce planes and munitions. In view of its mastery of mass production technique, it is inconceivable that it cannot meet a stiff timetable.

That we remember what happened to French preparedness when social experiments took precedence over everything else, resulting in limitation of armament output and complete breakdown of industrial discipline. Better housing and economic security and a higher standard of living for workers will mean less than nothing if our physical security as a nation cannot be protected.

That industry subordinate every other activity to forwarding the defense plan, that it scrupulously avoid any action which might be interpreted as exploitation of labor, and that wages and working conditions be kept on an unassailably high plane. After all, preservation of the private enterprise system is completely dependent upon preservation of our democracy.

That organized labor refrain from strikes which hamper speedy completion of the national effort, that it declare a truce in its own civil war, that it adjourn its campaign to restrict output of its members, and that it concentrate its energies on bringing the national program to a successful conclusion. Collective bargaining, the right to strike and the many other privileges which American labor now takes for granted would be cancelled overnight should our democracy be blacked out.

That we remember that the American dollar isn't made of rubber; and that if the prime need is planes, ships, guns, ammunition and the training of men, federal funds should be spent on those essentials and savings made in other directions.

That industrial expansion to meet the defense requirements be regarded as an emergency measure, ordinary federal tax and depreciation regulations being modified to permit speedier write-offs. Industry thus would not be saddled with a full tax load after the emergency is over when it can least bear it.

That candidates and politicians of all parties, for once, stop playing partisan politics and join in a vital national program.

That any political party preaching destruction of the democratic system and drawing any part of its support from a foreign power be outlawed and denied a place on the ballot.

That extraordinary measures be taken by the federal government to root out subversive activities, destroy fifth columns and prevent the placing of Trojan horses within our ranks.

That all aliens resident in the United States either become citizens, or, if they are judged undesirable or if they refuse, be deported.

That with the cooperation of all groups and of the government itself, full preparedness be achieved without abrogating democratic rights and principles.

That any surrender of civil rights be made with full knowledge that such surrender is a temporary measure taken to preserve to us and to our descendents those very rights which we now enjoy as free people in a democracy.

Burnham Finney

GAGING BUSINESS

Metal-working industry to feel full force of defense buying within sixty days. French and English place big machine tool orders. Builders expand output to meet extraordinary demands

The full force of the government's armament program will not be felt by the metal-working industry until Congress makes available the necessary funds to the Army and Navy and those agencies have time in which to place orders. If red tape can be cut, it is believed that contracts running into big figures will be awarded within the next sixty days. Meanwhile the industry is extremely busy filling domestic and foreign requirements most of which stem from war or defense plans.

Machine Tools—The English and French continue to pour orders into machine tool builders' plants, though foreign deliveries are stretched out into the middle of 1941. The Bristol airplane factory in England is to be duplicated, equipment orders for this job having been given U. S. companies. About 60 per cent of incoming business, however, is of domestic origin. Federal government contracts for defense purposes, which eventually will amount to well over $200,000,000, are being given preference over all other bookings. A Priorities Committee, suggested by the industry, has been set up to expedite that plan. The industry, confident it can meet all demands made on it, is resorting to various means to increase its capacity. Some companies, like Warner & Swasey, Jones & Lamson and Monarch, are further enlarging their manufacturing space. At least four companies are having complete machines built outside under their own inspectors. Most builders are having outside companies manufacture parts and sub-assemblies. A large portion of the industry is operating either 24 hours a day or two shifts running 50 hours or more a week each. Companies still on single shifts are up to 55 to 60 hours a week. Almost all builders are training large numbers of apprentices and "learners" to relieve the shortage of skilled men.

Aircraft—The aircraft industry's most important problem is to increase the output of engines as rapidly as possible. Wright, now making about 400 motors a month, is expected to be up to 900 by September. Pratt & Whitney will be producing around 1,000 engines a month before the end of the year. Allison Division of General Motors is far behind schedule. It turned out close to 40 motors in May. In June it will make 80 motors, of which 25 will come from Allison's old plant. Two prominent automobile makers are known to be seriously interested in building the Rolls-Royce Aircraft motor which the British government would like to see made in this country. Ford is reported making progress in tooling a line for manufacture of the Hispana Suiza motor. After being tooled at Detroit, this line is to be shipped to France for installation there. Immediate goal of the U. S. Government is to build up a fleet of 24,000 airplanes. For that number of planes, including spare engines, about 100,000 engines will be needed.

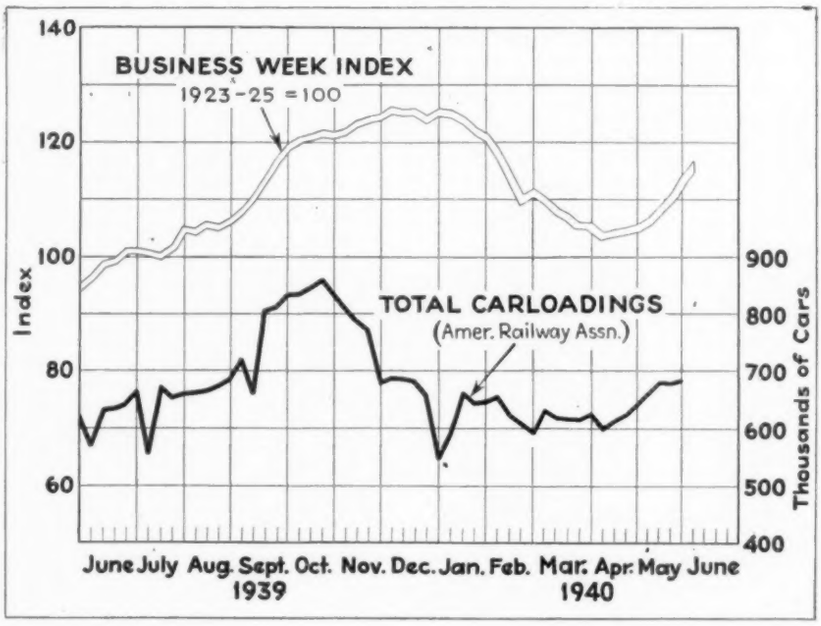
Tools and Dies—The country's tool and die making capacity is fully occupied, what with armament business piled on top of a peak load from the automobile industry for 1941 models. Within 30 days or less, however, most of the automotive tools and dies will have been completed, releasing more plant capacity for tooling programs tied in with defense work.

Farm Equipment—The industry is fulfilling early predictions of a 12 to 15 per cent gain over last year. Farm income is higher this year than in '39 and dealers' reports are optimistic. Caterpillar Tractor is running at a high production rate.

Railroad Equipment—Light buying is still the order of the day. Nineteen diesel-electric switchers have been ordered the past fortnight, 15 of them from Electro-Motive Corporation. American Car and Foundry will build 40 fusion welded tank cars to haul caustics. Pressed Steel Car has a new order for 500 box cars and 16 air dump cars. Pullman-Standard has a contract for 55 trolley coaches for the city of Milwaukee.

Munitions—York Safe & Lock Co. has been awarded 350 carriages for 37 mm. anti-tank guns, delivery to be made within one year. The Army is expected to place contracts shortly for 1,000 to 1,500 tanks. Large orders for shell steel are reported to have been awarded U. S. companies by the Allies.

Steel—As the steel industry swings into production of steel for the British and French to replace that formerly obtained from German-occupied territory, mill operations will soar close to full capacity. Domestic demand already is heavy.



KNUDSEN HEADS MACHINE TOOL COORDINATION

Action taken on recommendation of Army, Navy and Machine Tool Builders to strengthen role of the industry in the National Defense Program. Foreign shipments controlled

WASHINGTON—William S. Knudsen, president, General Motors Corp. has been designated by secretary of the treasury Morgenthau to coordinate the activities of the machine tool industry in the United States. Mr. Knudsen has already occupied offices in the Federal Reserve Building.

Mr. Knudsen's appointment and other steps to strengthen the strategic role which the industry must assume in the National Defense Program follow recommendations of the Machine Tool Coordinating Committee. These recommendations follow:

Honorable Henry Morgenthau,
Secretary of the Treasury,
Washington, D. C.

My Dear Mr. Secretary:

The informal committee representing the Machine Tool Committee, the Army and the Navy which met in your office on Monday, May 27, has held further meetings and submits the following:

1. The machine tool manufacturers will cooperate with the Government to the fullest extent and promise 100 per cent support in supplying machine tools as may be required to carry out the national defense plan.

2. A Defense Committee of the machine tool industry of fifteen leading executives representing important manufacturing plants in the industry and located over a broad area geographically has been appointed as follows:

Chairman: Clayton R. Burt, *president, Pratt & Whitney Division, Niles Bement Pond Co.*

Henry Buker, *vice-president, Brown & Sharpe Mfg. Co.*

F. H. Chapin, *president, National Acme Co.*

Howard W. Dunbar, *vice-president, The Norton Co.*

Ralph E. Flanders, *president, Jones and Lamson Machine Co.*

James Gleason, *president, Gleason Works*

Charles J. Stilwell, *president, Warner & Swasey Co.*

Fred V. Geier, *President, Cincinnati Milling Machine Co.*

Norman D. MacLeod, *president, Abrasive Machine Tool Co.*

Robert M. Gaylord, *President, Ingersoll Milling Machine Co.*

Phil Huber, *President, Excello Corporation*

E. A. Muller, *president, King Machine Tool Co.*

G. A. Rentschler, *President, General Machinery Co.*

Joseph L. Trecker, *president, Kearney & Trecker Corp.*

W. E. Whipp, *president, Monarch Machine Tool Co.*

J. E. Lovely—*Ex-Officio—president, National Machine Tool Builder's Association; vice-president and chief engineer, Jones and Lamson Machine Co.*

Secretary: Tell Berna *General Manager, National Machine Tool Builders' Association.*

3. The machine tool manufacturers agree that they will undertake to make deliveries of machine tools in time to meet the requirements of the government's program.

(a) By expanding the present working forces.

(b) By sub-letting parts and, if necessary, complete machines, to various factories not engaged in important government work and which have facilities and ability to produce the quality of work required.

4. A very important factor in determining deliveries of machine tools will be the allocation to foreign countries. This, we assume, will be controlled by the Machine Tool Coordinating Committee, hereinafter referred to.

5. The substitution of simplified machines instead of the present standard type of machines will greatly facilitate deliveries.

6. In the event that a large number of machine tools are required immediately, it will be necessary to commandeer many machine tools that are now on order for foreign countries.

7. It is recommended that a Machine Tool Coordinating Committee be set up as follows:

Chairman: Wm. S. Knudsen.

Vice-Chairman: Harold Vance, chairman of the board, Studebaker Corp.

Two representatives from the Defense Committee of the Machine tool industry: Ralph E. Flanders and Howard W. Dunbar.

Two representatives from the Navy: Captain D. Almy and Lt. Commander E. R. Henning.

Two representatives from the Army: Colonel H. K. Rutherford, Army & Navy Munitions Board and Major S. E. Reimel, Ordnance Department.

Other representatives to be added from time to time, if it is found necessary.

8. The Chairman and Vice-Chairman should be neutrals representing other interests than those represented directly on the Machine Tool Coordinating Committee.

9. It is recommended that the Machine Tool Coordinating Committee should be organized at once and that it should be empowered with the duties of determining the specific requirements of the Army, Navy, civilian and foreign customers, establishing priorities for the guidance of the machine tool industry in filling these requirements and in considering the creation of additional capacity, if and when found necessary.

WILLIAM S. KNUDSEN

10. Since no authority exists for the forcement of priorities at the present time, it is vital that cooperative action of all parties will be necessary if priorities are to be effective. The establishment of a Machine Tool Coordinating Committee as outlined, to perform the functions mentioned, is believed to offer the best solution to the machine tool problem.

11. Further meetings will be held in the near future at which time the Army and Navy will be prepared to submit details covering various lists of sizes, kinds and types of machines that will be required. This information is essential before any program can be determined regarding deliveries.

12. The machine tool industry plans to put into effect at once a policy of accepting both foreign and domestic orders for machine tools subject to priorities that may be set up by the United States government. This is for the purpose of keeping our industry in position to meet most effectively the requirements of the United States government when those requirements are defined.

13. We will later submit recommendations on what can be done to assist the industry by improving the labor supply.

Respectfully submitted,

Clayton R. Burt
Chairman, Defense Committee
Capt. D. Almy
Bureau of Shore Establishments, U.S.N.
Col. H. K. Rutherford
Director, Procurement Planning, Army & Navy Munitions Board.

President Plans to Train Million Boys to Aid Defense

WASHINGTON—President Roosevelt has mentioned plans for training one million youngsters to aid defense, in shops to be established all over the country by the National Youth Administration and possibly by CCC, WPA, the Office of Education and possibly other agencies. Informed persons say he plans to ask Congress for some $200,000,000 for this purpose. Emphasis would be placed on hand and powered tool practices in metal working, especially sheet work and welding. It is thought the plan will be worked out by the President himself, by Paul McNutt, as head of the Federal Security Agency, of which NYA is a part, and by Sidney Hillman, labor specialist in the new National Defense Commission. Meanwhile Aubrey Williams, head of NYA, hopes to increase to 100,000 the 38,000 youths he now has working on powered and hand tools, despite the fact that he does not as yet have the promise of any more money for NYA expenditures in 1941 than he had for this purpose in 1940.

Auto Builders' Part In National Defense Probably Over Emphasized

DETROIT—General Motors does not anticipate increased employment because of war business, C. E. Wilson, acting president, indicated at a press conference last week. He declared that in the absence of definite word of government requirements, the corporation's plants can easily handle war orders. He suggested, for example, that an additional 50,000 trucks could be handled yearly without trouble. And he said Michigan's part in rearmament has probably been over emphasized.

In regard to labor, Wilson stated that a study of wage adjustment had been held up by negotiations with the unions. In reply to questions about the union's demand for a 10 per cent wage increase Mr. Wilson covered the corporation's record for high wage payment and then said no course of action is justified that might tend to bring about inflation. He said "everyone is hopeful that we will not start the business of pushing up wages, prices and costs as was done in the last war."

BALDWIN WILL BUILD TANKS

WASHINGTON—Baldwin Locomotive Works has received a War Department order for light tanks totaling $587,694. It is reported that the Eddystone Works of Baldwin may become a center of large armament production which will not be confined to tanks. Other awards include the following: Eastman Kodak Co., $394,843 for height finders; Spencer Lens Co., $363,400 for height finders; Fargo Motor Corp., $372,204 for cars and trucks; Fairchild Aviation Corp., $66,980 for electric machine gun synchronizers; Vega Airplane Co., $63,550 for target assemblies, trainer assemblies and timers; American Tool Works, $123,873 for lathes; Pennsylvania Forge Corp., $74,911 for tubes for guns and forgings; American Steel Foundries (Milwaukee), $141,837 for castings and armor plate; Continental Motors Corp., $123,234 for aircraft engines and spare parts; William Sellers & Co., $105,255 for horizontal boring mills; Niles Tool Works, $73,107 for gun boring lathes.

CADILLAC GETS ALLISON WORK

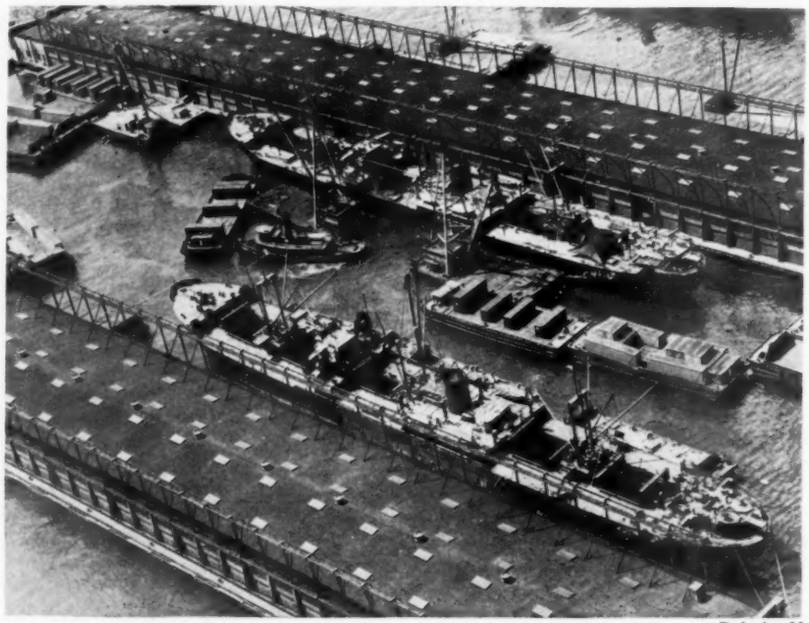
DETROIT—Cadillac Motor Division of General Motors is expanding its aircraft engine parts manufacture for Allison one-third by adding miscellaneous parts from the Indianapolis plant. Completely tooled equipment is to be shipped to Detroit from Allison and more machinery will be purchased to round out production lines. No increases in quotas have been made for previously assigned Allison parts at Cadillac, such as crankshafts and camshafts. Cadillac already has spent $1,000,000 on equipment for Allison work.

Auto Plants Likely to Build Planes for Defense Program

WASHINGTON—Top men in the government are receptive to having the auto industry take an important part in aircraft and plane-engine production. But government technicians are less enthusiastic about the possibilities, because they are more conscious of the differences between autos and planes; however, they don't rule it out.

No one takes seriously Henry Ford's remark that he could build 1,000 planes a day, but Edsel Ford is confident the company can do anything within reason. General Motors is already deep in the field with its Allison engine division, substantial holdings of North American Aviation, and its recently organized Aeroproducts Division which will make propellers and other plane parts. Packard has a light Navy marine engine that, it is suggested, might be redesigned for aircraft. And there is a constant undercover fight by auto and body firms to push into airplane manufacture via sub-contracting.

The airplane people are bitter about the progress of the Detroit juggernaut. They have a feeling that their industry is being taken away from them just when it is getting into the big money class. They are convinced too that anyone else will make a mess of the job. "Any system, other than orderly industry expansion directed by our own air industry leaders will fail—and fail miserably," says President Jouett of the Aeronautical Chamber of Commerce.



Rudy Arnold

Precious Cargo—*British Merchantmen Atos and Nyhorn at the free port zone in New York City load a huge cargo estimated to include some 300 American-made warplanes reported to be worth over $50,000,000. Crates on barges containing plane fuselages are being lowered into ships' holds.*

DEFENSE PLAN NEEDS $200,000,000 MACHINE TOOLS

Production has increased and shipments in April exceeded orders reports John E. Lovely at Machine Tool Builders' meeting. Increase in prices have been held to 15 per cent

CLEVELAND—The machine tool industry's part in the national defense was the dominant topic at the one-day spring convention of the National Machine Tool Builders' Association at the Hotel Cleveland, May 28. The national defense program will take over $200,000,000 worth of machine tools according to Clayton R. Burt, president Pratt & Whitney Division, Niles-Bement-Pond Company, and chairman of the association's Defense Committee. This committee was formerly known as the Committee on Cooperation with Government Departments. Mr. Burt reported on the meeting of his committee with government officials headed by Secretary of the Treasury Morgenthau which was held in Washington the preceding day.

JOHN E. LOVELY

"No matter how great may be the demands placed upon it, I am confident that the machine tool industry will be able to turn out machine tools just as rapidly as men can be trained to put them into actual operation," declared John E. Lovely, president of the association and vice-president Jones & Lamson Machine Company, in his presidential address.

"The industry is in a particularly good position to meet the challenge of tomorrow because during the last eight months it has already had what might be termed a dress rehearsal for tomorrow's far more serious performance and because throughout this period the industry has been absorbing and training additional men in preparation for the days which lie ahead."

Mr. Lovely pointed out that the machine tool industry has been greatly expanded and that any need for future expansion cannot be determined until the requirements ahead are known and until it is known that there is no confusion about priorities. To lighten the demand for new machines and to spread the load in the industry over a longer period, Mr. Lovely suggested that the government might well buy any equipment available in private industry not now vitally needed rather than insist that all the equipment for any new plant should be brand new.

For the last two months, Mr. Lovely revealed, the rate of production caught up to the rate of new orders. In April, in fact, shipments were larger than demand. Production has been increased steadily since last fall by hiring and training large numbers of men, by working longer hours and more shifts, by installing additional machine tools, by sub-letting work to other industries, and by adding to the size of plants.

Long Term Planning Needed

The greatest need is for long term planning in taking care of national defense requirements, said Mr. Lovely. With the help of its Defense Committee, the industry can regulate itself, provided that priorities are previously established. If the machine tool industry can do this, other industries ought to be able to do it.

Mr. Lovely said that prices of machine tools have increased not more than 12 to 15 per cent on the average since the outbreak of war. This increase has been necessary to meet the higher costs of production He admitted that in certain cases special machines were increased substantially in price, but they were exceptions.

CLAYTON R. BURT

Foreign Shipments Lowered

Foreign shipments today represent considerably less than half the output, whereas at the end of last year two-thirds of production was going abroad, stated Mr. Lovely. All along delivery preferences have been given American customers. The industry has succeeded in fulfilling by far the major share of machine tool requirements demanded for airplane engine builders.

David Ayr, president Hendey Machine Company and chairman of the Committee on Legislation, made a report thoroughly analyzing the Illinois retailers' occupation tax act as it affects the machine tool industry. The report was prepared in cooperation with Samuel F. Newman, president Landis Tool Company, and Joseph L. Trecker, vice-president Kearney & Trecker Corporation.

Frederick V. Geier, president Cincinnati Milling Machine Company, presented a paper on "Tax and Depreciation Policies." Mrs. Frida F. Selbert, secretary of the association, talked on the proposed machine tool orders index, and Myron S. Curtis described the new special shell lathe which he and his staff have designed for the association. Tell Berna, general manager of the association, made a brief report and read the report of the committee on electrical problems headed by B. P. Graves, Brown & Sharpe Manufacturing Company.

NO DIRECT ORDERS FROM LONDON

NEW YORK—All machine tools purchased by the United Kingdom in the United States will be purchased through the British Purchasing Commission on and after June 17, 1940, according to a statement by the Commission. The offices of the British Purchasing Commission are located at 15 Broad Street, New York. The new regulation is expected to accelerate deliveries. It is emphasized by the British Purchasing Commission that the Commission deals directly with manufacturers and not with intermediaries or jobbers.

Canada Reorganizes War Effort to Supply Equipment Needed Quickly By the Allies

MONTREAL—A rapid and widespread reorganization of administration of the Canadian war effort has delayed immediate placement of new war contracts, in behalf of Britain as well as the Canadian government. Canadian industrialists have found that until the various changes are settled, and responsibilities of the various departments and new officials are defined, winding up of contracts on promised scale has been held up. Also, the fast-changing situation in Europe, and possibility of changes being necessary in type of equipment most urgently needed has caused some confusion.

Main aim of the reorganization in administration is to achieve greater centralization and efficiency in direction of war work, and purchases of supplies. Minister of Defense Norman Rogers has been given more far-reaching powers and various subsidiary activities have been centered under one roof. Minister of Transport C. D. Howe has been given extensive powers in purchasing of supplies as minister of the revamped munitions and supply department. New extraordinary powers to Howe include authority to purchase up to $5,000,000 of supplies for the Canadian government without necessity of calling for tenders, and with only approval of Finance Minister Ralston required. W. F. Drysdale, vice-president of Montreal Locomotive Works, who was in charge of locomotive work in France in the last war, has been drafted as director of munitions, also in the department of munitions and supply.

The British government has undertaken to release all necessary specifications and blueprints for various war materials required, delay in getting which has been one reason for hold-up in Canadian output. Large-scale orders for shells, explosives, guns, and probably tanks and other motorized equipment, as well as airplanes, are promised immediately for Britain.

In addition to orders previously placed with eight Canadian plants for manufacture of 2,250,000 shells, contracts have recently been placed, or are about to be wound up, for another 2,250,000 of shells; and extension to plant facilities, to handle the increased business, already has been started. Size of these shells are 40 mm., 25-pounders, 3.7-inch, 4.5-inch, 6-inch and 9.2 inch. The complete shells are being made in Canada, with firms on sub-contract supplying cartridge cases, fuses, primers and similar parts.

Contracts for explosives already placed total $40,000,000, including 100 million rounds of small arm ammunition, individual gun barrels, anti-tank guns and other items.

Negotiations are under way, according to Minister of Supply Howe, for establishment in Canada of a large plant for the manufacture of airplane engines.

In connection with start of war supplies production in Canada on a larger scale, the Canadian department of munitions and supply has announced that during the last week of May orders for more than $1,000,000 of special munition machines, machine tools and other equipment were placed. This equipment will be used to boost production of small-arms ammunition in Canadian plants to a rate of 250,000,000 rounds for small arms annually.

BRITISH SEEK SMALL PLANES

NEW YORK—Agents for the British Air Ministry are scouring the United States for a fleet of light commercial airplanes to be used as observation units at the front for directing artillery fire. It is reported that planes with a 75-hp. motor and a speed of 105 m.p.h. are the type being bought.

South America to Get U. S. Arms and Munitions At Cost

WASHINGTON—Production at cost of munitions and war materials by U. S. arsenals, shipyards and industry, for sale to the republics of South America is authorized in a bill just passed unanimously by the Senate and sent to the White House. This measure was proposed and rejected by Congress several times in recent years. The House passed it last year. Other legislation is about to be enacted, forbidding the transfer of old-world territorial possessions in the Americas to other sovereignty. Thus the United States at last backs its Monroe Doctrine both in law and in arms.

Pratt & Whitney Aircraft Announces Further Plans for Plant Expansion

HARTFORD, CONN.—Increased demand for aircraft engines by the Allied forces and by the U. S. Government accounts for plans to increase again the capacity of the Pratt & Whitney Aircraft Division of United Aircraft Corporation. In accordance with an announcement by Frederick B. Rentschler, chairman of the board, space will be added to the East Hartford plant to bring monthly engine output to about 1,200,000 hp.

The expansion will cost approximately $8,000,000, bringing the total spent for the plant account by Pratt & Whitney Aircraft alone to $27,000,000 by the end of this year. This action has been taken in response to the national defense program, outlined in Washington, and the policy encouraged by Secretary Morgenthau to accelerate delivery under French and British contracts.

Two days after the announcement of the new expansion, structural steel was ordered for the building and already a considerable portion of machine tool orders have been placed. The new capacity is expected to be in full operation early next year.

The expansion program was announced less than eight months after ground was broken for an additional 270,000 sq.ft. on October 12, 1939. Three months after that date the first machines were in operation. Since then installation of machine tools has proceeded rapidly, and the addition is now working close to capacity.

The new wing in general parallels the plant layout described last year in *American Machinist* (AM—Vol. 83, page 369). The operating departments are arranged on either side of a central aisle, one side being devoted to work on aluminum alloy parts and the other to work on steel. Departments are devoted to the production of the various engine components; in general the new wing is a complete manufacturing unit in itself. However, it draws a few parts, such as pistons and miscellaneous parts, from the old plant because of ample available capacity. It was unnecessary to provide another heat-treating department.

The completed addition is known as the North Wing. Plans for the new expansion call for an extension of this wing to the East Works and an entirely new South Wing.

Altogether Pratt & Whitney production has been increased over threefold during the past two years. Present plans will add almost 50 per cent to the current capacity.

According to E. E. Wilson, president of Pratt & Whitney Aircraft, this division employed about 2700 workers at the beginning of 1939; a month ago the figure reached 8200. The total for United Aircraft Corporation, including all divisions, amounts to 13,000.

WATCHING WASHINGTON

President gives Knudsen free hand as industrial coordinator. Vinson bill permits Navy to commandeer all machine tools on foreign order. Allies to have first call on U. S. production

BY BLAINE STUBBLEFIELD

WASHINGTON—Spearhead of the new President's Advisory Defense Commission is William S. Knudsen, dynamic head of General Motors Corp. Because the country is not at war and because the President is reluctant to declare a further emergency or to use any more of his emergency powers than necessary, Mr. Knudsen will not be designated as administrator of defense plans. In effect, however, he will function in pretty much the same capacity as Barney Baruch during the world war. However, he will have an even more difficult assignment than Baruch in that he does not possess the legal authority to do a lot of the things which must be done. He must rely on moral suasion. It is not believed that the President will permit interference with Mr. Knudsen's operations. In fact, if his past performance is any criterion of the future, Mr. Knudsen will not remain as coordinator for defense unless he has a free hand.

That the White House intends to let industry do a good national defense job without being harassed by any pressure groups is evident from recent developments. Mr. Knudsen has taken over from Mr. Morgenthau the contacts with the machine tool and aircraft industries. It is understood that Mr. Morgenthau particularly disliked giving up his position as coordinator for the aircraft people. The fact is recognized in Washington that if the defense program is to be speeded, plants, including government establishments, will have to be put on multiple shifts. Restrictive labor laws, which act as a throttle on production, also must be modified. The time taken to place contracts on the "lowest-bidder" basis will have to be cut by substituting negotiated contracts. The new Vinson naval bill provides for negotiated contracts. The Army expects shortly to have authority to negotiate contracts too.

Navy Can Commandeer Machine Tools

The Vinson bill, which probably will be law before this issue reaches the reader, gives authority to the Navy Department to commandeer whatever materials it needs which are on foreign order. This provision is of special interest to the machine tool industry. It opens the way for the Government to take over all the equipment to be shipped to countries where deliveries cannot be made under present conditions—Sweden, Norway, Denmark, Holland, Belgium. Then it is believed that most if not all of the equipment destined for Russia and Japan will be commandeered. As a gesture in keeping with our neutral position, some machinery earmarked for England and France will be held for the Navy's use. But obviously nothing will be done to interfere with the Allies getting what they need as rapidly as possible. As a matter of record, the whole defense program is designed to help the Allies get materials quickly as well as to build up U. S. Army and Navy requirements. So long as the Allies are in critical need of planes, tanks, guns and other munitions, they will have first call on American production.

Defense Cost Totals $4,500,000,000

Defense program totals about $4,500,000,000, as compared with about $2,000,000,000 a year in recent years . . . National Defense Commission of seven is assigned definite responsibilities . . . Mysterious "embargo" on export of machine tools hits Japan . . . Standardization of airplane engines moves ahead . . . Civil Aeronautics Authority starts $37,000,000 program to train 75,000 pilots . . . President receives bill authorizing U. S. and manufacturers to sell munitions to South American republics . . . Administration looks favorably on automobile industry's ambitions in the airplane field . . . Legislation would permit navy contractors to spread losses over four years . . . Earmarking of a billion dollars RFC money to finance plant expansion and purchase strategic materials is proposed . . . Administration is still opposed to relaxation of labor laws; says employers' complaint that present laws would restrict production are unfounded; that there is no limit on hours if overtime is paid; the public will pay the bill . . . A pending measure would authorize the President to embargo all defense materials needed at home . . . Attorney General rules that war-time surplus munitions can be sold to the Allies without violating international or neutrality law.

Only 4,000 Planes for Defense

So sensational was the President's statement that he would like to see an airforce of 50,000 planes, that it takes a long time for the facts to catch up. Most of the public and a large part of the press are still under the impression that the defense program has these airplanes in it. Actually, of course, there is no intention whatever of buying any such number of planes. As long as the allies are in the war the bulk of our expanded production will go to them. Only if they are knocked out will it be necessary for us to support expansion with orders. Details of the latest billion and a quarter fund request are not yet available, but on a maximum figure, the 1941 defense program will not include more than 4,000 combat airplanes and a like number of training planes.

Government Will Aid Skilled Workers

All available information about the supply of skilled labor for defense manufacture is still foggy. The employment service of the Social Security administration is making a special effort, in connection with its regular spring census, to determine the whereabouts of skilled men in the various trades.

The Education Office of the Interior Department is checking up on the country's 1,300 trade, engineering and private technical schools to find out how many trainees could be handled under a "double shift" program, using evening and night hours. Dr. John W. Studebaker, Commissioner, tells AMERICAN MACHINIST the present enrollment of 500,000 probably could be increased to 750,000.

Best available information shows that the skill shortage is not in tool and die makers but in welders, machine operators, riveters, etc. At the same time, William Green, president of AFL, says that 200,000 to 300,000 machinists are unemployed.

It is expected the government will soon take action to aid available men in getting where the work is. But friction will develop if and when the Administration tries to speed up training for defense production jobs. Labor unions hate to lose control of apprentices, and they fear an oversupply of skills when the war ends. The administration claims aviation and other post-war industry will absorb them permanently.

JAPAN LIMITS PROFITS

TOKYO—The Japanese army has brushed aside all agencies in charge of Nippon's economy and announced it will take a direct hand in the control of profits in munitions plants and set its own "fair" prices. It is expected that foreign concerns will not be exempt from this control. Japanese imports of arms, vessels, vehicles and machinery so far this year have failed to reach records set last year and 1939; there has been a decrease of about 25 per cent.

Plastic Planes Likely To Have Place In Defense Plans

WASHINGTON — Plastic airplanes are getting serious consideration in the drive for large production. The most recent and probably most practical construction is plastic-impregnated plywood, usually formed on wooden patterns. Plywood planes could be built in non-metal-working factories, namely, furniture, and other woodwork plants, which would add tremendously to production capacity of the country. Opinion is pro and con whether strangers to the art even with a nucleus of initiates, could get going quickly. There would be some saving of weight but the saving in cost compared with some metals would be larger. Numerous plastic planes have been built and successfully flown during recent years. Note that this construction might lead to the transfer of other important equipment from metal to resins.

NEW CANADIAN WAR ORDERS

MONTREAL—Recent contracts awards (week ended May 25) announced by the Canadian department of munitions and supply include:

Mechanical transport—General Motors Products of Canada, Ltd., $78,881; W. D. Heath & Son, Ltd., Toronto, $99,173; Canadian Top & Body Corp., Ltd., Tilbury, Ont., $120,022; Brantford (Ont.) Coach & Body, Ltd., $41,424; Cockshutt Plow Co., Ltd., Brantford, Ont., $41,424; Ford Motor Co. of Canada, Ltd., Windsor, Ont., $92,350.

Aircraft supplies—B. W. Deane & Co., Ltd., Montreal, $15,011; Railway Power & Engineering Co., Ltd., Montreal, $12,640; Aviation Electric, Ltd., Montreal, $12,085; Robert Mulhall, Ottawa, $14,653; MacDonald Bros. Aircraft, Ltd., Ottawa, $13,402; National Steel Car Corp., Ltd., Hamilton, Ont., $32,200; Canadian Kodak Co., Ltd., Toronto, $39,031.

Ordnance—British War Office, $499,630.

Copperweld Steel Company Puts New Warren, Ohio, Plant Into Operation

WARREN—Frederick J. Griffiths, a pioneer in the development of alloy steels in the United States, is executive vice-president in charge of the new steel plant erected in Warren, Ohio, by the Copperweld Steel Company for the production of all grades of S.A.E. alloy steels in automotive and electric furnace quality. These include oxidation and corrosion resisting steels, aircraft quality steels, tool and special steels, and stainless steels. The plant is located on a 423-acre tract on the Mahoning river, 2½ miles north of Warren.

Electric Furnaces Used

Design of the plant is such that there is a direct flow of material in production. The melting department is equipped with two 25-ton and one 6-ton electric steel melting furnaces. Small furnaces were selected so that there can be uniform control of all phases of melting. Each of the two larger furnaces, made by Swindell-Dressler, is 16 ft. in diameter and will make average heats of 35 net tons. Each has an electrical capacity of 12,000 kva.

These two furnaces are said to be the largest top charging electric steel melting furnaces in the U.S. The combination of a swinging roof with a four-point suspension eliminates heavy stresses on the roof refractories. Charging of one of these furnaces, accomplished in less than 10 min., is accomplished with drop-bottom buckets. At the furnace is a pneumatic tube station for transferring samples quickly to the metallurgical laboratory, located in another building. Analyses are teletyped back.

Rolling Mill Equipment

After pouring, the molds remain undisturbed until the ingots have solidified. They then are transferred to a hydraulic stripper and the ingots go from there by underground conveyor to heating furnaces adjacent to the 29-in. blooming mill. The blooming mill building also houses a 24-in. three-high bar mill of heavy construction. This mill is provided with both shearing and hot sawing equipment. Ample pit capacity is provided for slow cooling of bars and billets. The product of the 24-in. mill is delivered to a transfer cooling bed, then to a billet storage building. Here there are additional cooling pits, pickling tanks and cleaning equipment.

Additional rolling equipment includes an 18-in. bar mill consisting of two three-high and one two-high stands, a 12-in. bar mill of five stands, and a 9-in. bar mill of two stands. The 18-in. mill is equipped with a hot saw and is adjacent to a large cooling bed. A double 210-ft. long cooling bed serves adequately the two smaller rolling mills.

In charge of sales for Copperweld's steel division is vice-president Sidney D. Williams, whose experience includes work with Carnegie Steel Company, Central Iron and Steel Company, Pittsburgh Crucible Steel Company, and from 1926 to 1940, the Timken Steel and Tube Division of the Timken Roller Bearing Company. Other key positions in the organization at Warren are filled by men of long experience in the manufacture of alloy steels. Among these are C. W. Holmquist, general works manager; John P. Smith, chief engineer; Paul Lindberg, superintendent of rolling mills; H. F. Peschel, chief roll designer; Roy F. Lab, chief chemist; Floyd Stroup, superintendent of melt shop; J. Russell Penman, production manager; Norman L. Deuble, assistant to vice-president; and W. J. Buechling, chief metallurgist.

F. J. GRIFFITHS

C. W. HOLMQUIST

S. D. WILLIAMS

INSIDE DETROIT

Labor's plea for Federal intervention in GM contract negotiations may prove boomerang if the public gets unduly excited over importance of auto plants in the present emergency

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—Behind a smokescreen of securing labor's cooperation in national defense, General Motors and the UAW-CIO continued maneuvers in a battle of wages versus profits, with a Federal conciliator as umpire. The union's position in regard to a new contract hinges upon a general wage increase rather than a share in profits, and is based upon the contention that the corporation can well afford to give labor an additional $20,000,000 to $25,000,000 yearly in view of such profits as that of $183,000,000 in 1939.

To this the corporation replied that profits derive from good management and good products, as well as factors beyond control of the corporation or the union, but that a change in the profit picture is divorced from labor's effort. Its wage rates, approximately on a par with that of Chrysler, are considered the highest in the automotive industry and higher than paid by other industries. Consequently, GM is not disposed to upset the wage-structure applecart of American industry unless the cost of living goes up. In fact, the corporation would be willing to keep the present contract.

Upon these apparently unreconcilable viewpoints the battle was joined, with R. J. Thomas, union president, authorized to call a strike.

Strike Would Be Serious

Admittedly a strike is serious at any time of the year for an automobile concern. The union would have preferred earlier Labor Board elections, in order to back up its demands with a strike threat while production was still at a high level and demand unsatisfied. Now only a few weeks remain of the current production season, but an immediate shut-down would embarrass dealers in the late summer. And a tie-up on the present huge tool and die program could prove very expensive to GM's competitive position at the start of the new model season. No matter how well die work is spread around among independent shops, the lack of a few tools may stop an entire program.

The talk that automotive labor must be pacified in order to secure its cooperation in the national defense program is simply a means of opening the door to political meddling. Informed sources know that procurement programs and production of domestic automobiles and trucks do not mix very well. While it is the intention of the Army to use some trucks with as few changes as possible from present commercial designs, the volume of such orders can hardly be a large percentage of domestic production, and passenger car output would be little effected by military considerations. There is plenty of idle capacity in the automobile industry that can be put to work on special trucks, combat cars, airplane parts or other material, after suitable rearrangement, modernization and tooling up. These steps take months, whereas the labor controversy is in the present.

Contract Is "Severe"

For weeks prior to and during the negotiations for a new contract, the union educated its workers to demand a wage increase that would represent a share of GM's profits. To this end the Federal Trade Commission's report of the auto industry was thoroughly studied in the locals. And locals were instructed to refrain from independent action and unite solidly behind the top leadership. Under these conditions, it is impossible for union leaders to hide their chagrin and mounting anger over the "severity" of the contract proposed by the corporation.

The main point at issue, wage increases averaging ten cents per hour, was flatly rejected. Instead, the corporation agreed to pay a vacation bonus equal to 2½ per cent of the annual wage, which is an innovation among automobile manufacturers.

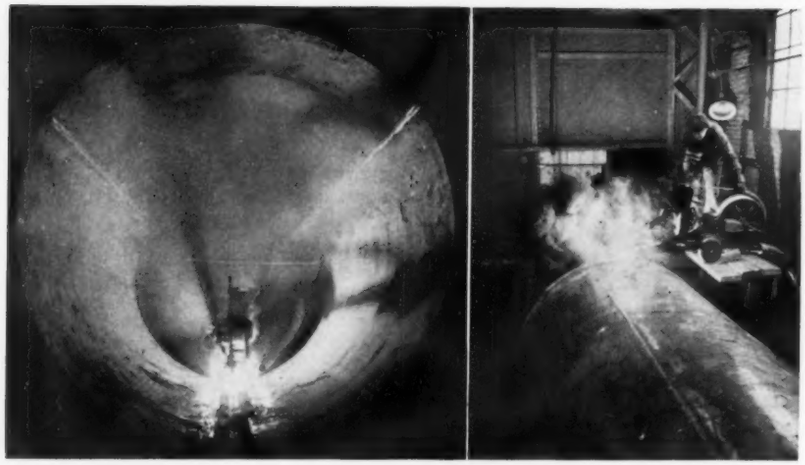
The ten-cent-an-hour raise, say union conferees, was designed to reduce grievances. Workers in the lowest and medium brackets of a given classification might have got more than those receiving top rates. The working out of these new rates was to have been left to the discretion of the union and the plant manager, with the proviso that the total increase in any plant would not exceed an average of ten cents per hour per worker.

The contract proposed by General

AWAITS DEFENSE PLANS

DETROIT—Executives in the automobile industry are as much in the dark as the average citizen in regard to the government's plans for cooperation by private industry in the national defense program. Nothing tangible is expected for several weeks. Meanwhile the industry adopts the "business as usual" slogan and hopes that the automobile buyer will not crawl into his shell. Large field stocks plus remaining production of current models must be sold before the 1941 lines are announced. Contrary to rumor, the 1941 model changes will go through without change; tooling for these models will be completed this month. But a model change may be skipped next year.

Pure Research—*Two new engineering and research laboratories have been opened at Chrysler's Highland Park plant. Some 162,000 sq.ft. of floor space in the new building almost doubles the space devoted to research. Layout of the routine ferrous laboratory, above, is result of four years' planning. Beyond is the special ferrous problems lab*



Less Twist—*Freedom from distortion is one of the advantages of automatic carbon arc welding, employed in fabricating aluminum tank cars at the Milton, Pa., plant of American Car & Foundry Co. Tanks are 78 in. in diametetr, 32 ft. long, and $\frac{5}{8}$ and $\frac{1}{2}$ in. thick. Square-edge tight butts welds are used throughout. Photos courtesy Lincoln Electric Co.*

Motors is more "severe" in regard to strikes than agreements with other manufacturers, say union sources. For example, the union can not ask unemployment compensation for workers in a plant shut down because of a strike in another plant. In other words, strikes can not be called without authorization of the international officers, and they derive support for such action from the union as a whole, which makes it responsible. Sit-downs, slowdowns, or any restriction or interference with production are also prohibited.

So far, General Motors has refused to be stampeded by the UAW-CIO's showing in the Labor Board elections and regards wages as separate from profits. On the other hand, concentration of power in the hands of the international union officers has steadily progressed, and the workers have been educated to expect and demand concessions. The fight may flare up suddenly because the union feels it must now fight a rearguard action to save its recent gains in the face of growing public condemnation of strikes as detrimental to national unity in the defense program of the future.

Aviation Corp. Buys Detroit Plant

Aviation Corp. has purchased the Barkley-Grow Aircraft Corp., Detroit, from General American Transportation Corp., and will operate it as the Barkley-Grow Aircraft Div. of Aviation Mfg. Corp., a subsidiary. Barkley-Grow is now actively working on several inquiries, and may shortly move into the Stinson plant in Wayne, another Aviation Corp. subsidiary. Stinson has transferred practically all of its operations to a new plant at Nashville, Tenn., including equipment. Thus, it is possible that Barkley-Grow may purchase at least $300,000 worth of equipment and tooling with which to fabricate training planes at a rate of up to 25 per month. Or the plant may be operated as a parts manufacturing enterprise, as dictated by government requirements. Harold Kondolf, vice-president of Aviation Mfg. Corp., is in active charge of Barkley-Grow at present. Designing and manufacturing personnel will be expanded as plans mature.

FRENCH GET U. S. ENGINE EXPERTS

NEW YORK—J. Carleton Ward, former general manager of Pratt & Whitney Aircraft, accompanied by Harold Johnson of Cadillac Motor and other General Motors production men, are reported to have gone to France by clipper to take charge of putting French aircraft engine production on an efficient basis.

Surface Finishes Discussed At M.I.T. Summer Conference

CAMBRIDGE—Friction, surface finishes and allied problems held the attention of more than 160 engineers, research workers and production supervisors at a special summer conference on these subjects held at Massachusetts Institute of Technology on June 5, 6 and 7. Ample evidence of the present industrial interest in the reduction of friction and in the production of high-quality surface finishes was given both by the quality of the papers presented and by the amount of discussion each evoked.

The Wednesday morning technical session, under the chairmanship of Prof. J. C. Hunsaker, was a discussion of the production and metallurgy of surface finishes. Papers presented were: "Some General Aspects of Rubbing Surfaces" by A. F. Underwood, General Motors Research Laboratories; "Metallurgy of Surface Finish" by Dr. John Wulff, M.I.T.; and "Preparation of Smooth Surfaces" by David A. Wallace, president, Chrysler Sales Div., Chrysler Corp.

Papers presented on Thursday included: "Description and Observation of Metal Surfaces" by Stewart Way, Westinghouse Research Laboratories; "Surface Friction of Clean Metals" by Hans Ernst and M. E. Merchant, Cincinnati Milling Machine Co.

Friday's technical papers included: "On the Mechanism of Boundary Lubrication" by Otto Beeck, Shell Development Co., and "Thin Film Lubrication" by F. C. Linn, General Electric Company.

One of the interesting points brought out during the discussions on Wednesday was the statement that grinding cracks usually are the result of improper heat-treatment. However, they usually start as "checks" which are only as deep as the layer of the material that is disturbed by the pressure and heat of the grinding operation.

DAVID A. WALLACE

HANS ERNST

PLANT EXPANSION

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has moved its Oakland, Calif., office into a new $100,000 building. Completed by the Austin Co. in 45 days, the structure contains 60,000 sq.ft. of floor space.

American Rolling Mill Co., Middletown, Ohio, is planning enlargement of its No. 2 blast furnace at Hamilton, Ohio. Capacity of the furnace will be increased from 350 tons of pig iron per day to 650 tons. Work, to begin Aug. 15, will cost approximately $400,000.

Boeing Aircraft Co., Seattle, Wash., is embarking upon an expansion program which will increase its floor area by more than 75 per cent. Addition will involve an expenditure of approximately $2,000,000, and will provide over 600,000 sq.ft. more floor space.

The Bullard Co., Bridgeport, Conn., has awarded contract for the construction of a 360x90-ft. addition to its foundry. Structure, to comprise one story and basement, will be ready for occupancy in three months.

Jones & Lamson Machine Co., Springfield, Vt., has begun construction of a 21,000-sq.ft. addition to its plant. An extension to the assembly lines, a new shipping room and a new paint spray room will be included.

Kempsmith Machine Co., West Allis, Wis., is planning a $6,000 office and shop addition.

Warner & Swasey Co., Cleveland, Ohio, has announced a second recent addition to its plant. The 30,000-sq.ft. extension started a month ago will be increased by another 20,000 sq.ft. In addition, the basement of the main building will be extended 12,000 sq.ft. to provide more space to store finished parts.

NAMES in the NEWS

C. K. Bryce, formerly manager of factories, Oxweld Acetylene Co., New York, N. Y., has been elected vice-president.

T. D. Cartledge and L. A. Bliss have been elected vice-presidents of Linde Air Products Co., New York, N. Y. E. J. Hayden has been elected vice-president of the Central Div. E. B. Suydam, formerly assistant general sales manager, has been appointed general sales manager to succeed Mr. Cartledge. P. B. Pew, formerly assistant works manager, has been appointed works manager to succeed Mr. Bliss.

SIDNEY A. STEWART

H. MANSFIELD HORNER

CHARLES J. McCARTHY

Pierre S. du Pont has retired as chairman of the board and Lammot du Pont has resigned as president of E. I. du Pont de Nemours & Co., Wilmington, Del. Lammot du Pont was elected chairman, while Walter S. Carpenter, Jr., a vice-president, was made president.

Henry J. Fishbeck, chief metallurgist of Pratt & Whitney Div. of United Aircraft Corp., East Hartford, Conn., has been appointed process engineer with coordinative supervision of engineering and manufacturing departments.

C. W. Simpson, formerly vice-president and works manager of National Acme Co., Cleveland, Ohio, has been made executive vice-president. R. C. Kinley, superintendent, has been made vice-president and works manager. B. H. Ayers, assistant superintendent, has been appointed superintendent.

John Slezak, since 1931 vice-president and general manager of Turner Brass Works, Sycamore, Ill., has been elected president.

Walter S. Tower, executive secretary of the American Iron & Steel Institute since 1933, has been elected president, chief executive officer and a director of the Institute. He succeeds E. T. Weir, chairman of National Steel Corp., who has served as president for the past year.

D. A. Williams, president, has also been named chairman of the executive committee of Continental Steel Corp., Kokomo, Ind., to succeed Niles Chapman, deceased. Urlin K. Becker has been elected a member of the executive committee and also vice-president and treasurer. William G. Harter, assistant treasurer, has also been named secretary.

H. Mansfield Horner has been named general manager of the Pratt & Whitney Aircraft Div. of United Aircraft Corp., East Hartford, Conn. Sidney A. Stewart has been appointed general manager of the Hamilton Standard Propellers Div., and Charles J. McCarthy has been appointed general manager of the Vought-Sikorsky Aircraft Div. in Stratford.

Mr. Horner went with Pratt & Whitney in 1926, a year after it was founded in Hartford to become the original nucleus of United Aircraft. He worked first in the assembly, test and inspection departments of the factory, and later was assigned to the purchasing department. After two years he was named assistant treasurer, and before his appointment as assistant general manager in 1938, he held the posts of assistant secretary, secretary, and assistant sales manager.

Mr. Stewart was employed by Standard Steel Propeller Corp. (predecessor of Hamilton Standard) as a helper in the assembly department in 1929, and joined the Hamilton Standard sales department in 1930. The following year he was made sales manager, holding this position until his appointment as assistant general manager three years ago.

Mr. McCarthy joined Chance Vought Aircraft as executive engineer in 1926, was made chief engineer in 1930, and became engineering manager in 1935. In 1937 he was appointed assistant general manager, retaining this position when Chance Vought and Sikorsky were consolidated to become the Vought-Sikorsky Aircraft Div. in 1939.

John C. Harrington, Jr., has been elected president and general manager of National Forge & Ordnance Co., Irvine, Pa., succeeding the late Clinton E. Wilder.

Frederick G. Hughes, general manager New Departure Div., General Motors Corp., Bristol, Conn., has been elected president of the Anti-Friction Bearing Manufacturers Association.

CLARENCE A. RAFTREY

MAX W. LIGHTNER

JOHN G. BERGDOLL

Clarence A. Raftrey, for the past six years assistant works manager of Cadillac Motor Car Div. of General Motors Corp., has been appointed works manager of Cadillac. He succeeds Victor A. Olsen, who has been appointed general manager of the Detroit Transmission Div.

Mr. Raftrey was born in Chelsea, Mich., in 1897, and first became associated with the automobile industry through the Lewis Spring & Axle Co. of Jackson, Mich. In 1926 he entered the General Motors organization through Chevrolet. He has been with Cadillac since 1929, and has served as service promotion manager and production manager before his appointment as assistant works manager in June, 1934.

Max W. Lightner has been appointed assistant to the general superintendent at the Homestead works of Carnegie-Illinois Steel Corp., Pittsburgh, Pa. He was formerly chief metallurgist at Homestead.

Mr. Lightner, who received degrees in metallurgy from Pennsylvania State College and Carnegie Institute of Technology, began his corporation service as an assistant metallurgist at Homestead in 1933. He was appointed assistant chief metallurgist in 1934, and became assistant superintendent of Open Hearth No. 4 in 1936. He has been chief metallurgist since 1937.

A. O. Samuels, formerly president of Samson-United Corp., Rochester, N. Y., has been named general manager of the new electrical appliance department of Casco Products Corp., Bridgeport, Conn. Jack Shenberg, former assistant secretary of Samson-United and director of merchandising sales, has been appointed assistant manager of the new division.

George Schaefer has resigned as superintendent of Plant No. 4, Art Metal Construction Co., Jamestown, N. Y. He is succeeded by H. R. Nelson.

John G. Bergdoll has been appointed chief engineer of York Ice Machinery Corp., York, Pa.

Born in Philadelphia, Mr. Bergdoll graduated with a degree in mechanical engineering from Lehigh University in 1920. He was first employed by York Ice Machinery Corp. as a machinist's apprentice in 1914 in connection with a high school cooperative course, and since then has occupied the positions of draftsman, equipment development engineer, product engineer, and assistant chief engineer.

BUSINESS ITEMS

Continental Aviation & Engineering Corp., has been incorporated in Richmond, Va., with an authorized capitalization of $1,000,000.

William Jessop & Sons, Inc., New York, N. Y., has appointed Bisset Steel Co., Cleveland, Ohio, as representative for its line of tool steels.

Mau-Sherwood Supply Co., Cleveland, Ohio, has been appointed distributors for the line of anhydrous metal cleaners offered by Cowles Detergent Co., Cleveland, Ohio.

North & Judd Mfg. Co., New Britain, Conn., hardware and metal specialty manufacturer, has purchased the hardware and buckle business of Alma Mfg. Co., Baltimore, Md. The business will be continued by North & Judd in Baltimore for the time being, but eventually all manufacturing activities will be centered at New Britain.

Pines Winter Front Co., Chicago, Ill., automobile radiator shutter manufacturer, will be liquidated. Company's equipment inventory will be sold to Piraco, Inc., which will continue operating the Pines plant pending possible consolidation with an affiliated company.

Pomona Pump Co., Pomona, Calif., has established executive offices in New York, N. Y. C. L. Barrett, formerly general sales manager, has been elected vice-president in charge of sales, and W. D. Turnbull has been appointed general sales manager in charge of the New York office.

F. L. Robertson, Buffalo, N. Y., has taken over the manufacture and distribution of the line of power transmission equipment formerly made by Builders Iron Foundry, Providence, R. I.

Uddeholm Co. of America, Inc., New York, N. Y., has taken over the warehouse tool steel business of SKF Steels, Inc., New York, N. Y.

Udylite Corp., Detroit, Mich., has moved its New York office to 60 East 42nd St.

OBITUARIES

James E. Burns, 73, retired consulting engineer for Remington Arms Co., Bridgeport, Conn., died May 20.

Charles F. Lawrence, 74, for many years a widely known machine tool motor and control specialist in the Boston office of the General Electric Co., died May 23 in Newton, Mass.

Raymond G. Moore, formerly chief engineer of the Bassick Co., Bridgeport, Conn., died recently at his home in that city.

William H. Quinn, 48, New York district manager for Chain Belt Co., Milwaukee, Wis., died suddenly May 5 in New York. He had been with the company since 1923.

August C. Thode, 62, assistant pattern shop superintendent, Allis-Chalmers Mfg. Co., Milwaukee, Wis., died May 14 in Milwaukee. He had been in the employ of Allis-Chalmers for 39 years.

MEETINGS

American Society of Mechanical Engineers. Semi-annual meeting, Hotel Pfister, Milwaukee, Wis., June 17–20.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 24–28.

National Foreign Trade Council. Twenty-seventh national foreign trade convention, San Francisco, Calif., July 29–31.

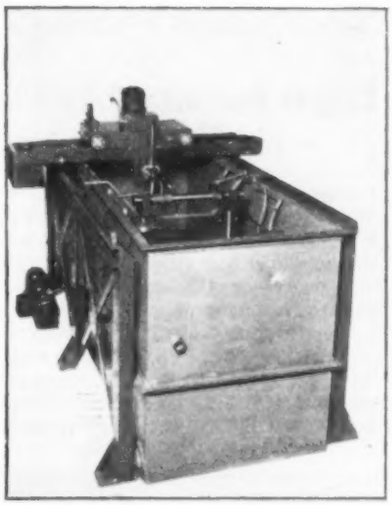
SHOP EQUIPMENT NEWS

Brown & Sharpe No. 12 Plain Millers Have Been Increased in Capacity

The No. 12 electrically controlled plain milling machines made by Brown & Sharpe Mfg. Co., Providence, R. I., which for several years have been used advantageously by manufacturers who require a fully automatic machine for the production milling of medium-size work, have recently been increased in capacity. The height of the column has been increased 4 in., thereby providing a corresponding increase in the vertical adjustment of the spindle; the total adjustment is now 10½ in. Width of the base has been increased 2½ in. with a corresponding increase in the horizontal dimension of the working space. Distance from the face of the spindle head to the arbor yoke support now measures 17⅛ in.

Fixtures and work pieces proportionately larger can be handled on the improved No. 12 plain millers with no sacrifice of efficiency or increase of power consumption. All features of design and construction have been retained, although a number of minor improvements and refinements have been made throughout the machine to make it a more efficient production unit. Floor space requirements and the net weight of the machine have been necessarily increased slightly.

Column height has been increased 4 in. and base has been widened 2½ in. on No. 12 Brown & Sharpe electrically-controlled plain millers



Shorter Flame Hardener Handles Gears and Shafts

The No. G2 surface hardening machine offered by Celtic Works, Shorter Process Co., Ltd., Savile Street East, Sheffield, 4, England, features infinitely variable speed control, a special cam-type twin gas control valve and fixtures for hardening spur gears, bevel gears, single and double helical gears, and all straight shaft surfaces. The machine head comprises a fabricated steel carriage having four runner wheels. This carriage is driven by a motor through an instantaneous action saw toothed clutch and chain and sprocket mechanism. The adjustable blow pipe mounting unit has precision controls.

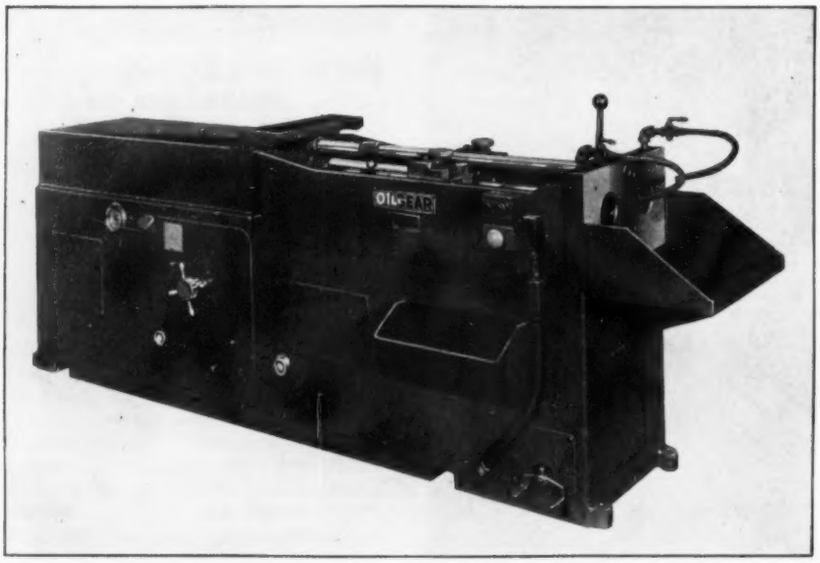
The whole assembly is mounted on a fabricated cross carriage for positioning at any required point and can be traversed longitudinally from the tank. The final drive motor incorporated in the machine head is worked in conjunction with a Ward Leonard set. Fixed to the operating side of the carriage is a control panel where one knob operates the shunt regulator in the generator field circuit and is so arranged that with an a.c. input to the set the first movement of the knob operates the contactor in the Ward Leonard set. Further movement increases the speed of the geared drive motor. A fine adjustment knob also is provided. The control panel is provided with a speedometer graduated from 0 to 14 in. per min.

The front side plate of the machine head is carried down in the form of a slotted apron. A rigid guide finger may be bolted to this plate and, when in contact with a helical gear

to be treated will, as it meshes with the helical tooth, revolve the wheel to bring the tooth progressively into proper relation with the burner. This keeps the distance between the burner and the work constant. The work is mounted by means of cones and work arbor spindle between vertically adjustable V-blocks. The assembly is supported on a fabricated rotating pedestal or turntable running on guides in the tank bottom. The machine is supplied with a special non-backfiring blowpipe, including one single jet burner. Special burners and quenching units to suit special hardening requirements can be supplied as extra equipment. The large water tank is equipped with water feed controls and leveling valve.

Oilgear Horizontal Broaching Machine
Suitable for Internal and External Operations

Having a normal pulling capacity of 12,000 lb., this Type XB-12 twin horizontal broaching machine announced by the Oilgear Co., 1302A W. Bruce St., Milwaukee, Wis., incorporates a simple pushbutton and alternative toe-lever switch control on each side of the machine. Emergency stop pushbuttons also are placed on each side of the machine. A Type DX-1211 Oilgear two-way variable



displacement heavy-duty radial piston fluid power pump with simplified piping and oil circuit is mounted in the base of the machine. Independent variable broaching speed control is provided for each crosshead. Pullers are provided with vertical adjustments and there is a mechanism for adjusting length of crosshead stroke.

Ease in operation and control, with less operator fatigue, is said to be possible with the simple pushbutton control. No effort or skill is required to perform complex operations. The machine can be controlled from either side by one or two operators. It is necessary to depress only one button to start the broaching stroke of one crosshead and the return of the other. Both of the operator's hands can be free to handle the work and tool by controlling the crosshead motions with the alternative toe-lever switches on either side of the machine. Conventional control valves, levers, links, rods, springs, detents and pins have been eliminated. Preset relief valves built in the pump protect the work, tools, pump and machine against overload. These twin horizontal broaching machines are designed especially for high speed internal and external broaching operations on small and medium sized parts. The two rams work alternately, one on the return while the other is pulling, so that the production is limited only by the operator's ability to serve the machine. Ample space is provided on the face plates for mounting duplicate complex fixtures.

For supporting long tools, a standard trough with hardened and ground steel ways, is provided. Dual guided carriages and dual clamping fixtures also are used when long tools are necessary. General specifications: Normal capacity, 12,000 lb.; peak pulling capacity, 18,000 lb.; cutting and return speeds, 4 to 30 ft. per min.; broaching stroke, 36 in.; distance between crossheads, 10 in.; distance between ways, 6 in.; motor recommended, 10 hp.; floor space required, 34 x 142 in.; over-all height, 48 in.; net weight, 3,900 lb.

Standard Speed Lathes
Feature Special Clutch

Developed especially for production service on small parts requiring polishing, countersinking, reaming, burring and filing, the improved

speed lathe introduced by Standard Electrical Tool Co., 1940 W. 8th St., Cincinnati, Ohio, is said to be suitable for use in aeronautical, automotive and similar industrial plants. An outstanding feature of this equipment is the clutch and brake arrangement for stopping the work spindle while the motor continues to operate. With this unit the work spindle may be stopped for inspection of work as often as required, the clutch and brake being actuated simultaneously through a foot pedal. These machines are available with a single speed only, but can be furnished in any speed required from 150 to 3,450 r.p.m. in sizes from 1.2 to 2 hp. Antifriction bearings are used throughout. The clutch operates in oil, insuring quiet operation. Regular equipment includes a Morse taper socket, but a drill chuck or Universal lathe chuck can be furnished. Bulletin No. 152 gives full details.

Hannifin Machine Combines
Several Machine Tools

The No. 10 combinaiton toolroom machine announced by Hannifin Mfg. Co., 621–631 S. Kolmar Ave., Chicago, Ill., combines in one compact unit a precision lathe, sensitive drill press, horizontal milling machine and vertical milling machine. In addition to convenient handling of regular toolroom work, this machine may be used for economical production of many parts made in small quantities. The spindle of the lathe is hardened and ground and is mounted in ball bearings. It is arranged to take adapters having

B&S No. 10 tapered shanks. The compound slide, designed for precision work, has simple, rapid adjustment features and extra strong tool slide. A 4-in. three-jaw universal chuck is furnished for the lathe spindle. Likewise, a three-jaw No. 6-A Jacobs ½-in. chuck is provided for the tailstock.

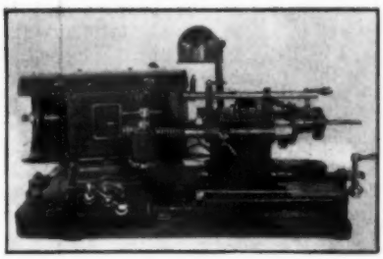
The sensitive drill press unit is designed for accurate work and has easily accessible controls. The 9-in. adjustable table is mounted on the main machine column. Both rapid hand feed and worm drive feed are provided. The spindle is mounted in large ball bearings. A reversible motor is used to drive the drill spindle and is controlled by a convenient switch at the top of the column.

The horizontal milling machine is

adapted for all classes of work. The spindle is mounted in ball bearings and the table is fitted to long bearings with adjustable gibs in the saddle. Precision horizontal, vertical and cross feeds for both the horizontal and vertical milling units have hand wheels fitted with micrometer scales. A single screw vise with swivel base is furnished. This machine also can be arranged for screw cutting with quick change gear box, which also provides power feed for the saddle. Capacity, length of thread, 18 in.

Blake Tap Grinder Has Positive Mechanical Controls

The "JB" tap grinder introduced by Edward Blake Co., 53 Marshall St., Newton Center, Mass., can be used for sharpening two, three, four, and five fluted taps uniformly on the chamfer. It will sharpen right or left-hand taps and will grind any taper or angle of chamfer desired. Amount of relief can be set accur-



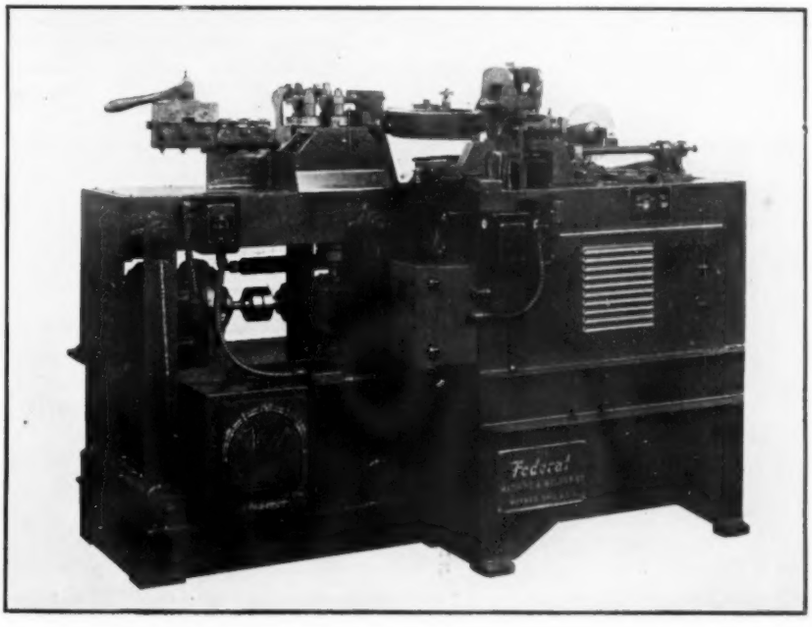
ately and quickly changed. Taps of any length held on the outside diameter of thread, can be sharpened in sizes from No. 0 to ½ in. inclusive. When held on shanks, taps of any lengths ranging from No. 0 to ¾ in. diameter can be ground while taps up to 5 in. long held on centers can be ground in sizes from No. 0 to 2 in. inclusive. A stop in the spindle permits grinding taps to uniform lengths.

This bench-type machine is self-contained and is supplied complete with motor, diamond tooling device and extension cord ready to run. The machine consists fundamentally of a base on which are mounted a motor head unit and work head unit. The work head is mounted on a slide with a screw feed for easy adjustment to various length taps. The work head unit rocks on a shaft in the base plate slide and is connected to a special adjustable eccentric mechanism with the crankshaft spindle. The desired relief is obtained by a simple screw adjustment of this eccentric mechanism.

A scored mark shows the exact position where the eccentric is locked to position the work. A pin in the eccentric shaft holds it stationary when locating the tap land in correct position and when loading or unloading the work. The crankshaft spindle is connected with the work spindle through a train of gears. To grind taps with a different number of flutes, it is necessary to remove and change only one gear. A plate on the machine lists the correct gear for each number of flutes. The machine weighs 125 lb. and occupies 16 x 28 in. bench space. A ¼-hp., 110 volt, 60 cycle, a.c. motor is used.

Federal Machine Unit Straightens Wire Then Forms and Welds Hoops Automatically

The Federal Machine & Welder Co., 212 Dana Ave., Warren, Ohio, recently has developed a completely automatic machine which takes wire from a supply reel at a uniform speed of approximately 150 to 175 ft. per min., straightens it, forms hoops, and then welds the ends together. The wire first is drawn through two-plane, quick release, straightening rolls by a double set of spring-loaded pinch or drive rolls. Straightening equipment all is mounted on a floating carraige shown at the left. The wire then passes through three adjustable forming rolls and into a sizing ring where it is formed into a hoop of the required diameter. After the hoop has been formed, it is sheared to the exact circumferential length, welded and automatically ejected on a stacking fixture. An arrangement for counting the hoops as they are ejected from the welder is set to operate a limit switch so that when the required number of hoops is in place in the fixture, the fixture is tripped automatically and



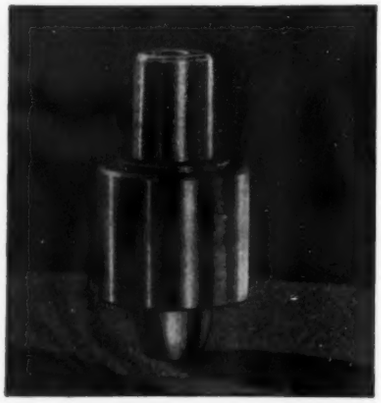
a new stack starts to pile up without affecting the operation of the machine.

This particular machine was arranged to weld rings of No. 10 or No. 11 gage wire, 14 to 15½ in. in diameter. The rings are held to within 0.005 in. in diameter and after they are ejected from the machine they are flat within 1/6 in. From 1,500 to 1,800 hoops per hour are produced. The only labor required being to load the coil of wire in the reel and to remove the completed hoops in stacks of approximately 250 from the stacking fixture. While this particular machine was developed for certain sizes of rings, the same method can be used for almost any size of wire, within certain limits, and any diameter of ring.

New Departure Bearing Circulates Lubricating Oil

The No. TP-13-500 vertical tension pulley bearing announced by New Departure Div., General Motors Corp., Bristol, Conn., contains its own oil circulating system for speeds of 3,500 to 15,000 r.p.m. The bearing provides a vertical stub shaft on which a drive pulley is mounted. By the circulating system, oil is drawn from a reservoir below the bearing and is passed in a fine spray or mist directly to the balls and races. Since the bearing is of the self-sealed type with all-metal seals, the oiling system is completely inclosed and oil need be added only at yearly intervals.

Another feature of this bearing is its ease of rotation, there being no drag in the seals or resistance to

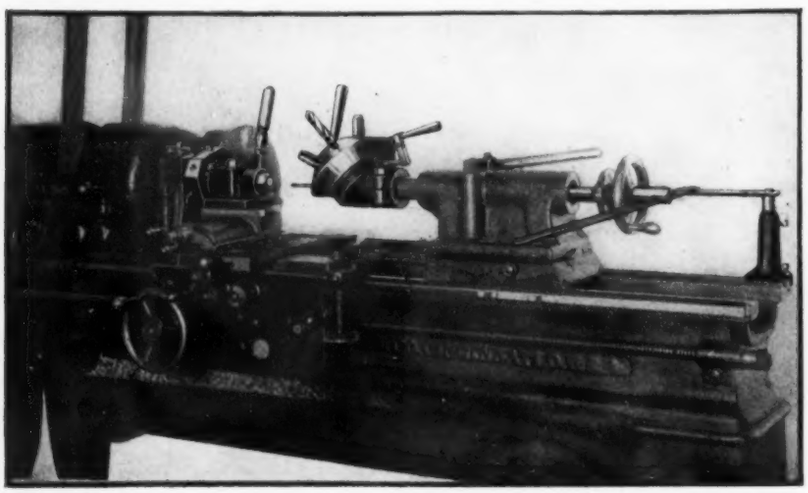


turning by the lubricant. The bearing requires no lock nuts, screws or other parts, and it may be removed quickly without tools for reoiling, and as quickly replaced.

Jefferson Lathe Attachments Convert Engine Lathes

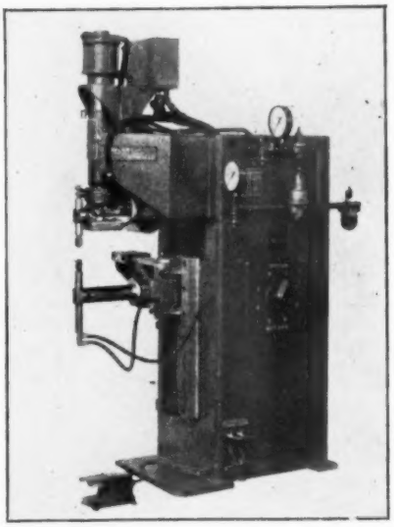
Attachments which can be used to convert any standard engine lathe into a turret-type machine have been made available by Jefferson Machine Tool Co., Fourth, Cutter and Sweeney Sts., Cincinnati, Ohio. These devices, shown mounted on a belt-driven engine lathe, comprise a tailstock turret, a tool post turret and an adjustable pull feed, any or all of which may be mounted on any size of lathe. The tailstock turret accommodates five tools and is attached easily to the spindle of the tailstock. Once set in place, each tool automatically centers when brought into position. The tailstock turret permits forming, roughing, boring, finishing, drilling, tapping and other operations without stopping the lathe or shifting belts. Three sizes of this turret are available for different sizes of lathes.

Designed for mounting on the tool post of a lathe of any style or size, the tool post turret provides for four separate tools. Openings for tools measure ⅝ x 1¼ x 1½ in. The head may be adjusted to any desired angle by loosening a rear screw at the top of the head. The third attachment, the adjustable pull feed, attaches to the tailstock spindle of the lathe and eliminates the turning of the spindle feed wheel. It can be used on any lathe having a swing of 18 in. or less. Feed wheel is not removed. This device can be adjusted for long or short motions and is adjustable for height.



Taylor Winfield Welder Has Combination Knee

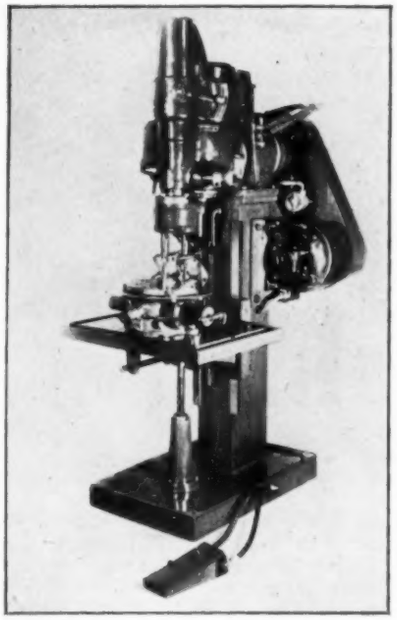
A combination lower horn and knee, which are placed 90 deg. apart on a common casting, is featured in this adaptation of a standard Type EN press-type welder manufactured by The Taylor-Winfield Corp., Warren, Ohio. The swinging knee, when placed in one position, provides conventional spot welding points and



holders. When swung to the opposite position, the knee permits mounting of projection welding dies. The swinging bracket is clamped in a vertical face plate and is readily adjustable beneath various die sets. This 12-in. adjustment is by means of a screw. The machine is furnished in standard throat depths up to 30 in. and with transformer capacities from 30 to 75 kva. The swinging combination knee can be furnished in air-operated and motor-operated as well as on hydraulic machines.

Kaufman Tapping Machine Has Chucking Dial

This No. 5-A "Hi-Duty" tapping machine announced by L. J. Kaufman Mfg. Co., Manitowoc, Wis., has a No. 40 index and 8 station chucking type dial arranged to hold circular pieces for tapping. The chucking jaws, or complete dial, can be changed to accommodate different work of a similar nature. Two pieces are produced at each stroke of the two-spindle multiple head. Ejection of

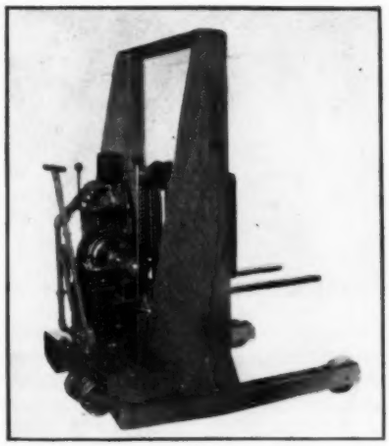


finished parts is automatic. All operations are interlocked to prevent damage. The tap spindle will not travel on its downward stroke unless the stations and index pin are in position.

Work dials to accommodate 8, 12 and 16 stations can be furnished, their layout depending in part upon the material being tapped and the speed at which the taps can be run. All operations are performed with air pressure, including the indexing, locking and clamping of parts. The machine is entirely air controlled, permitting sensitive operation with all sizes of taps within its range. Dies can be used for threading.

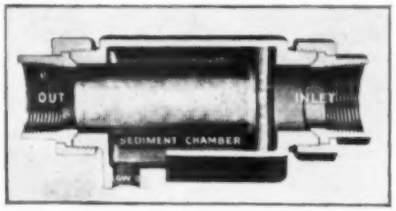
Lyon Elevating Truck Operates Hydraulically

A two-speed hydraulic hand pump and a motor-driven hydraulic pump are provided in this fork-type elevating truck offered by Lyon Iron Works, 10 Madison St., Greene, N. Y. The truck is arranged so that the fork can be elevated by hydraulic hand pump by moving the pump handle backward and forward without opening or closing any valve. A valve control lever is moved to the elevating position when elevating the forks with the motor-driven pump. This truck is used for handling pallets and is of 3,000 lb. capacity. The forks are 27 in. long, 18 in. wide over-all, and have a lowered height of 2 in. Elevated height of forks is 48 in. All wheels are 7 in. in diameter and have 3 in. face. They are equipped with ball bearings.

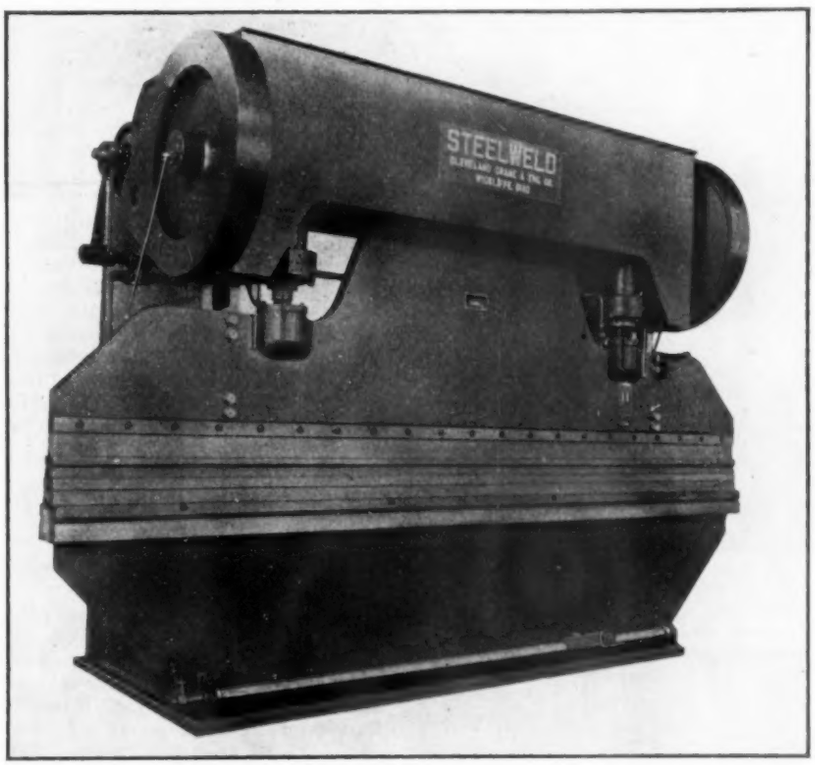


Wright-Austin Strainers Are Easy to Keep Clean

Made in six sizes, for ½ to 2 in. pipe, the "Easyclean" strainer offered by Wright-Austin Co., 315 W. Woodbridge St., Detroit, Mich., is suitable for steam, air gas, oil or water lines. The strainers are as easy to connect as a union in a pipe line and are easy to clean. A dirt pocket in the bottom of the strainer collects dirt and scale before reaching the screen. Scale and dirt held in the sediment chamber are easily discharged through a blow-off opening. The screen is made of perforated sheet brass and has 400 1/32 in. holes per square inch. The cast semi-steel body is suitable for working pressures up to 250 lb.



Cleveland "Steelweld" Bending Press Brakes Adaptable for Extensions at One or Both Ends



Development of a series of "Steelweld" press brakes adaptable for extensions of bed and ram at one or both ends has been announced by Steelweld Machinery Div., The Cleveland Crane & Engineering Co., Wickliffe, Ohio. Illustrated is a Model H-8 brake recently completed for a Stockholm, Sweden, Company which is provided with extensions of 2 ft. on each end. This press normally handles plate measuring 96x$\frac{5}{16}$ in. between housings, but the extensions make possible the forming of No. 12 gage plate 14 ft. wide. Other presses in this series will handle plate in lengths up to 20 ft. and thicknesses up to ¾ in.

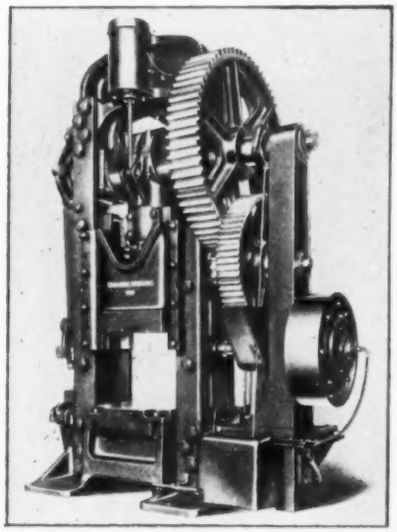
The frames of these presses are of one-piece all-welded construction. All gearing is protected in inclosing covers. Shafting and drive equipment are located at the rear of the machine, thus preventing damage from bent-up plates and crane hooks. Two solid forged steel eccentrics, one on each end of the machine, operate the ram. Each eccentric has three large

main bearings and an eccentric bearing. The bearings automatically are lubricated by two pressure-type oiling units mounted on either end of the machine. The main drive clutch is of the double multiple-disk type and is adjusted easily without tools. Usual brake troubles are eliminated by using a clutch, that is a duplicate of the main clutch, for braking. Bending, forming, blanking, drawing and multiple-punching operations may be performed. Gages and indicators provided on each machine make it a simple matter to obtain identical results repeatedly with a set of dies.

Chambersburg Trimming Pressses Feature Pneumatic Clutch

Chambergsburg Engineering Co., Chambersburg, Pa., is offering a line of double geared steel side trimming presses in capacities up to 1,000 tons. Sizes of 150 tons and over are equipped with an improved type of pneumatically operated clutch.

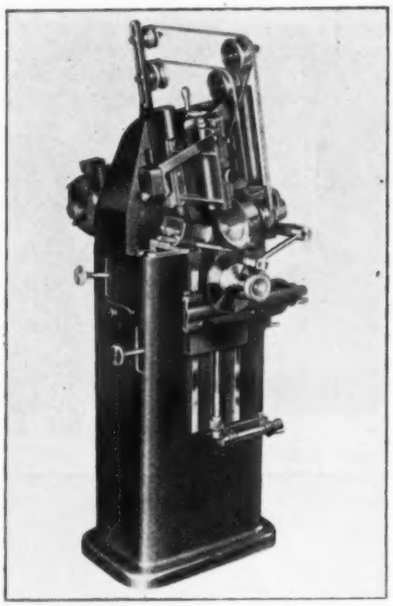
All presses are of patented forged



steel side frame construction, and the standard Chambersburg features of oversize crank, the use of outboard bearings on all shafts, reinforced pitman, extra large pitman pin, and gears cut from solid steel are included. It is claimed that these presses are particularly well suited for use under forge shop conditions.

Covel-Henchett Grinder Sharpens Metal Saws

The No. 11-30 metal saw sharpener announced by the Covel-Henchett Co., Big Rapids, Mich., is claimed to simplify the grinding of the high-efficiency saw blade now being used on hydraulically operated cold metal sawing machines and other metal-sawing equipment. Cams are used so that teeth of proper shape with necessary clearances can be ground automatically. The machine is equipped with anti-friction bearings throughout. Saws ground on this machine feature a tooth shape designed to obtain the proper rolling action of the chip being cut. This special tooth shape automatically is

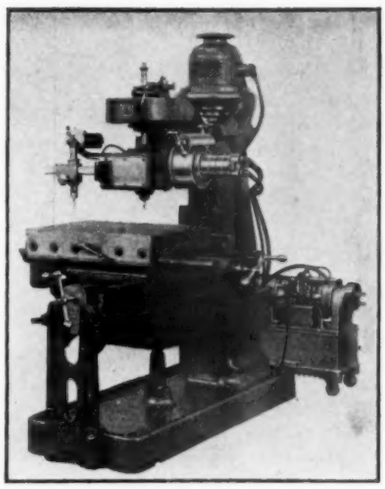


ground under the control of cams mounted inside the base of the machine. The saw on which this tooth is used is equipped with alternate high and low teeth to assure distribution of the load between the teeth, and the grinding of the teeth is accomplished automatically in the machine. The high teeth are beveled on each side to insure proper cutting action. This machine also is available with hack saw attachments in order to sharpen blades having the same tooth shape.

Detroit Universal Duplicator Provides Sensitive Control

It has been called to our attention that the milling machine shown under the above title in a previous description of an improved duplicating control made by the Universal Duplicator Company of Detroit (*AM*—Vol. 84, page 266) is a No. 3VS vertical miller manufactured by Reed-Prentice Corp., Worcester, Mass. The Reed-Prentice Corp. has an exclusive agreement with the Detroit Universal Duplicator Co. for the application of this control unit to vertical milling machines for die sinking and other duplicating.

The No. 3VS vertical miller shown is designed especially for making molds, die casting dies and forging dies, jigs, fixtures and other parts in the toolroom. Table and knee adjustments are by hand, with a longitudinal feed of 27 in., a cross feed of 20



in., and a vertical feed of knee of 16 in. The head is adjustable on the column for a distance of 5 in. Thread depth is 22 in.

Hardinge Index Fixtures Hold Work Conveniently

Designed to permit the serviceability of the index fixture to be extended into production departments, three collet index fixtures have been placed on the market by Hardinge Brothers, Inc., Elmira, N. Y. These three fixtures are arranged to meet any position requirement or combination of requirements. All fixtures take the same No. 5 C Hardinge 1-in. capacity collet, affording interchangeability. The collet sizes may range in any fractional round hole sizes from $\frac{1}{64}$ in. to the capacity of 1 in.; hexagon and square sizes also are available, as are step collets for special applications.

The collet index fixture with a

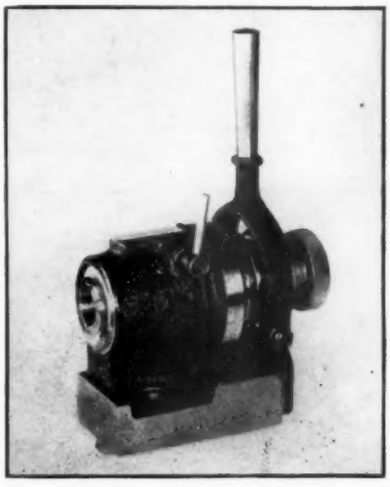


Fig. 1—The Hardinge horizontal collet index fixture is equipped with a lever collet closer for rapid opening and closing of the collet. Indexing is rapid

plain handwheel, shown in Fig. 1, is provided with a means for rapid opening and closing of the collet. This makes rapid production possible for parts which must be machined and then indexed for additional machining operations. Moving lever to the right causes the collet to properly grip the work. When the lever is moved to the left the collet opens. When making a set-up, the desired collet grip can be made instantly. This grip is self-locking to assure the same tension for all parts. The index plate has 24 holes providing division of 2, 3, 4, 6, 8, 12 or 24. The over-all height of the fixture is 10¾ in. over the handle, over-all length is 6½ in. and the width is 3¾ in. The ground face has ½ in. wide removable keys to fit the sub-base or machine table.

The vertical collet index fixture shown in Fig. 2 also is arranged with a lever collet closer for rapid production work. The index plate for this fixture has 24 holes to obtain 2, 3, 4, 6, 8, 12 and 24 divisions. The fixture has an over-all height of 6 in., an over-all width of 9½ in., and an over-all length of 8⅛ in. The spindle has a lever for rapid and convenient

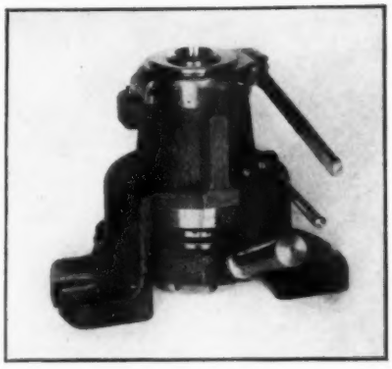


Fig. 2—The vertical collet index fixture has a lever for rapid and convenient positioning of the spindle when indexing

positioning of the spindle when indexing. This lever is arranged to drop out of the way after indexing and to take a convenient position to permit the disengaging of the index pin and indexing the spindle to the next position. This vertical fixture is arranged for two bolts for application to the machine table.

The combination horizontal and vertical collet index fixture shown in Fig. 3 has the features of both the horizontal and the vertical collet index fixtures incorporated into one unit. This fixture takes the same No. 5C collet as the other fixtures, and the index plate also is provided with 24 holes arranged with a method to pre-select any hole or combination of holes to be indexed. This production types index plate eliminates the necessity of reading the graduated dial

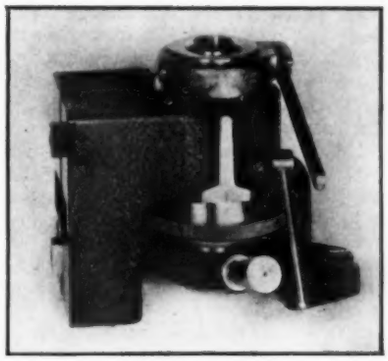


Fig. 3—A production-type index plate eliminates reading of the graduated dial for setting the work on the combination horizontal and vertical collet index fixture announced by Hardinge Brothers

for each indexing of the work. The spindle is provided with a lever indexing arrangement which operates the same as that on the vertical collet index fixture described above. Dimensions of the fixture when used vertically are: height, 6 in.; width, 9½ in.; length, 8 in. When the fixture is used horizontally, the over-all height is 7¾ in.; over-all width, 9½ in.; over-all length, 6 in.

Van Dorn Wire Brushes Have Tufts Locked In Place

"Whirlwind" wire wheel brushes developed by The Van Dorn Electric Tool Co., Towson, Md., are available in sizes, thickness and wire gages to suit practically any wire brushing

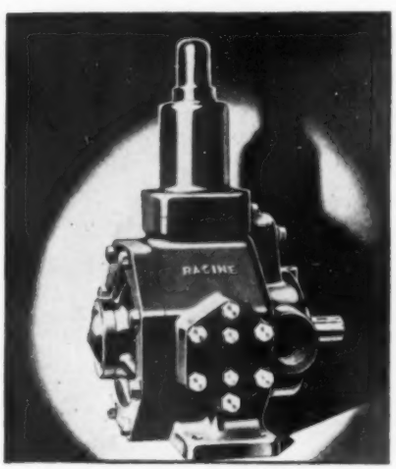
application. The coarse wire is recommended for cleaning castings, removing scale, paint and rust, and other heavy-duty cleaning and burnishing operations. Fine wire is best adapted to work on aluminum, brass, molds, auto body work, buffing and finishing. One-section, two-section and three-section brushes make it easy to adapt brush thickness to the job. The variety of sizes, from 4 to 12 in. diameters, permit the use of these brushes on all types of grinding, buffing, polishing and cleaning machines. Interchangeable arbor-hole adaptors enables the immediate use of these brushes on practically any size spindle. Individual tufts of wire, containing a liberal number of strands, are inserted under the curved fingers of the center disk or washer. These fingers then are driven down tight against the body of the washer, locking each tuft securely in place and anchoring the wire strands. Each tuft is fastened independently without "tie-in" with other tufts. The individual tufts "fan out" to present a solid, even brushing surface of extra density.

Racine Hydraulic Pump Provides 1,000 Lb. Pressure

Rated at 1,000 lb. per sq. in. continuous pressure, a variable volume hydraulic pump developed by Racine Tool & Machine Co., Racine, Wis. features hydraulic balancing of the vanes by means of improved porting of the side plates. These side plates are of hardened bronze and permit close working and sliding fits without the danger of scoring and seizing. The new pumps are of the same over-all dimensions as the former 500 lb. per sq. in. capacity pumps and are interchangeable in the field.

Features of the new pumps are: larger diameter shaft; needle bearings are wider and are of larger diameted with needle rollers taking the radial load; oil seals are of the mechanical self-compensating type; vanes and rotors are heat treated, hardened and ground; vane slots are slanted away from the direction of rotation; the accurately ground steel pressure chamber ring imparts a smooth, harmonic action in the vanes and prevents gouging and wear.

In addition to the variable volume constant pressure feature, which is obtained by a simple type of hydraulic governor, the pumps also are furnished with manual hand wheel for positive control of volume. Another combination consists of a dual pressure control, operated hydraulically or electrically, permitting maximum volume at low pressure—for rapid traverse movements—and mini-



mum volume or deadhead holding at high pressures. The pump shown is equipped with an automatic hydraulic governor control.

Warren Mushroom Lamps Do Not Need Reflectors

Inside silver plating as a reflector makes the "Deluxe" mushroom lamps made by Warren Lamps Co., Warren, Pa., suitable for use in many locations, as they are not harmed by

dirt, fumes, and require no cleaning. Light concentration is obtained by using a specially designed parabolic-shaped bulb which gives a good directional light pattern. These lamps are available in sizes from 75 to 300 watts capacity.

Ruthman Coolant Pumps Available in Small Sizes

The Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio, has announced the addition of a line of Model P-3 "Baby" gusher coolant pumps in types and sizes especially adapted for use on small lathes, grinders, honing and lapping machines, automatic lathes, and on larger machines requiring only a moderate volume of coolant. These pumps are of the same general design and construction as the larger gusher

coolant pumps. Essential features are a bulit-in motor, rugged vertical shaft suspended on prevision ball-bearings, double suction intake which provides a balanced impeller, and construction details which permit easy installation on both old and new machine tools. These pumps have no packing nuts, foot or relief valves, and require no priming. Their double intake and balanced thrust impeller is built without metal to metal contact—proof against injury by grit or small chips. Throttling the pump does not overload the motor. These pumps are listed in four types.

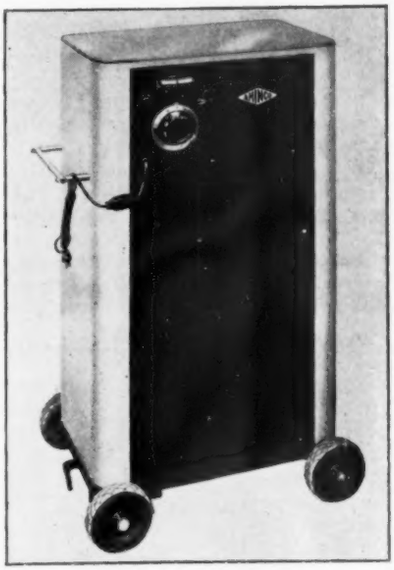
Detroit "Easy" Sander Has Reciprocating Action

The "Easy" portable electric sander developed by Detroit Surfacing Machine Co., 7433 W. Davision, Detroit, Mich., can be operated from any a.c. or d.c. light socket. Power is furnished by a specially designed universal motor and the grease-sealed ball-bearing construction is claimed to insure trouble-free, quiet, vibrationless performance. Forced ventilation cooling is provided by a fan mounted on the motor shaft. A built-in filter removes injurious dust and grit from the air before entering the motor. The reciprocating action of the sanding pad stimulates the

natural back-and-forth motion used by finishing craftsmen. One-third of a standard size sheet of abrasive of any grit fits the sanding pad without waste. This sander, complete with motor, weighs 6½ lb.

Aminco Area Determinator Measures Flat Objects

The "Aminco" area determinator announced by the American Instrument Co., 8010–8020 Georgia Ave., Silver Spring, Md., is designed for the rapid measurement of the area of any flat object of any shape, color or texture that will fit into a circle 9.93 in. in diameter. The object may be opaque or translucent, or transparent if temporarily coated with an opaque or translucent substance. The instrument is especially useful for measuring the area of maps, drawings, graphs, photographs, engine indicator diagrams, printed designs on paper or fabric, and other objects. It eliminates less accurate planimeter measurements. It is accurate within 3 per cent of the true area; reproducibility is with 0.2 per cent. This accuracy is not affected by the experience of the operator or the nature of the object's outline. A measurement can be made in 45 sec. regardless of the experience of the operator or the complexity of the



object's outline. Measured area is read directly from a dial. Complete details are given in Bulletin No. AM-2081. The instrument measures 18 x 26 x 42 in. high and operates direct from lighting circuits. The housing is mounted on four wheels having pneumatic tires.

B-C Tote Box Truck Speeds Materials Handling

A simple tote box truck introduced by the Barrett-Cravens Co., 3255 W. 30th Sq., Chicago, Ill., reduces effort on the part of the move men, speeds handling of parts, and reduces damage by making an easy job of moving them from machine to machine, or to or from the stockroom or storage space. Of all-welded steel construction, these units will support any weight that can be carried in a 22-in. long by 11 in. wide tote box. In many cases, the boxes can be tiered as many as three high for movement at one time with this truck. The arms or prongs on these trucks are spaced so as to engage the handles on the standard tote box. After the prongs have been made to straddle the box, a slight pressure on the handle lifts the box off the floor and it can be

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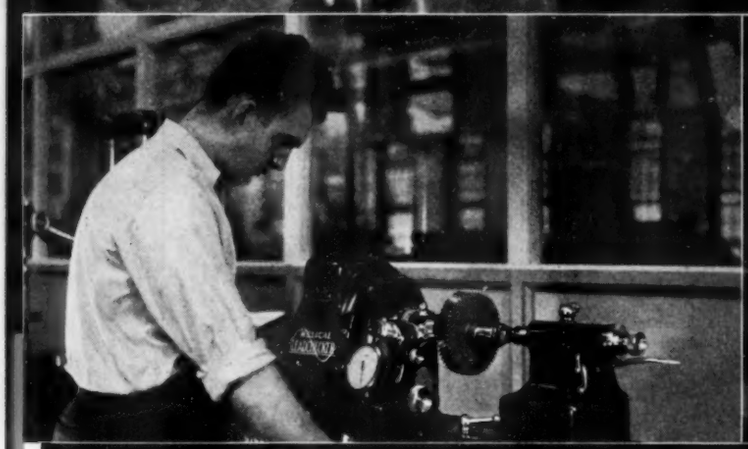
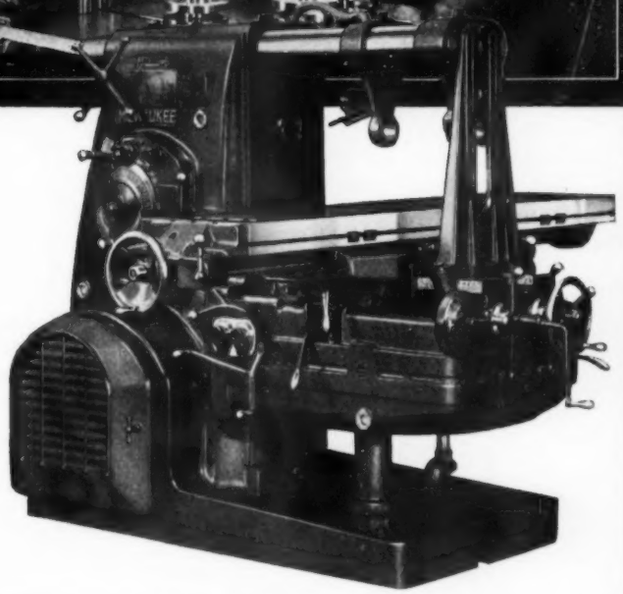
- ✓ INSPECTION





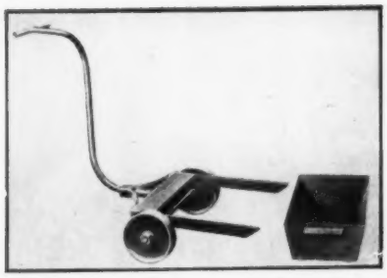
The performance-accuracy of Milwaukee Milling Machines is assured by constant testing, checking and inspection. A staff of 75 highly trained technical men are engaged in this important task.

In the world's largest plant devoted exclusively to the manufacture of milling machines there can be no variation from high manufacturing standards.

Kearney & Trecker Corporation
MILWAUKEE, WISCONSIN

K&T

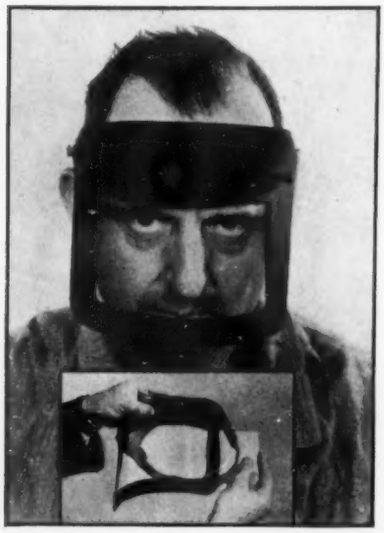
Milwaukee **MILLING MACHINES**



trucked to any location. Special trucks are available for boxes of other than the standard size.

B & C Face Shield Has Replaceable Window

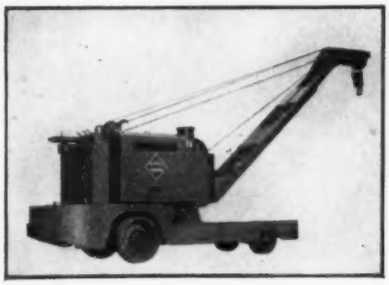
Equipped with a plastacele window that slides in and out of a fibre frame, making replacements easy, this face shield has been announced



by the Boyer & Campbell Co., 6540 Antoine St., Detroit, Mich. Besides simplifying replacement, the fibre frame affords more face protection than the conventional metal bound type. The frame is interchangeable on all models of B&C face shields except Nos. 10 and 20. This shield is recommended especially for spot, flash and gun welding, buffing, polishing, wire brushing, and similar operations. A 24-mesh monel screen window is used in place of the plastacele window when babbitting, for heat protection and for band sawing. A glass holder is available to provide protection for acetylene welding, burning and scarfing.

Elwell-Parker Crane Holds 1½ Tons at 7-ft. Radius

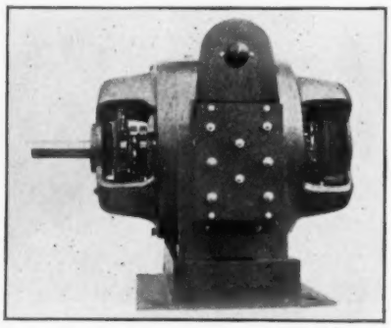
The streamlined No. C-4 power industrial crane brought out by the Elwell-Parker Electric Co., 4025 St. Clair Ave., Cleveland, Ohio, has a rated capacity of 3,000 lb. at a 71 ft. radius and travels at speeds up to 5½ miles per hour, depending on voltage of battery. The standard telescoping boom, 12 to 19 ft. long, slews approximately 300 deg. in 20 sec. Hook speed varies from 30 to 50 ft. per min. Storage battery or gas-electric power is optional. Four motors individually drive the travel,



hook hoist, boom hoist and slew, and all may be operated simultaneously if desired. Motors governing hook hoist, boom hoist, and slew are directly accessible and are equipped with solenoid brakes. These cranes are fitted with full magnetic contactor control equipment.

Kato D.C. Electric Motor Delivers 60-Cycle A.C. Current

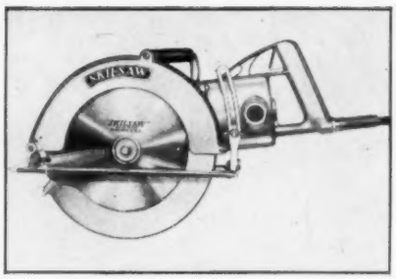
The Kato Engineering Co., 530 N. Front St., Mankato, Minn., has placed on the market a line of d.c. motors which, in addition to driving a piece of equipment, furnish 60 cycle a.c. current for the operation of an auxil-



iary function. For instance, when one of these motors is used to drive a "Doall" contour sawing machine, the a.c. supply for the butt welder used to join saw bands is taken off the motor.

Skilsaw Electric Hand Saw Uses 12-in. Diameter Blade

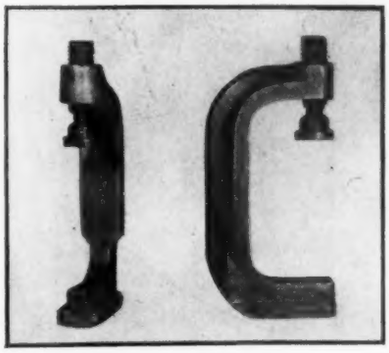
The improved Model 127 portable electric hand saw developed by Skilsaw, Inc., 5033 Elston Ave., Chicago, Ill., has a 12-in. diameter blade and cuts to a depth of 4⅜ in. It is suitable for cutting wood, building tile and for continuous cutting of copper sheets up to ⅝ in., lead sheets up to 2 in. thick and many types of heavy gage corrugated metals. It will rip and cross-cut timbers up to 4 in.



thick. Bevel-cuts at 45 deg. can be made in lumber 3$\frac{5}{16}$ in. thick. The blade has a free speed of 2400 r.p.m. and is protected by an automatic spring operated telescoping guard that rotates on all bearings. A blower attachment built into the upper guard keeps the cutting line free of sawdust.

Advance Machine Clamp Speeds Job Setups

The clamping device illustrated is offered by the Advance Machine Works, 3727 Weisser Park, Fort Wayne, Ind., in sizes from 1 to 12 in. to replace bolts, struts and jacks in setting up jobs on machine tables

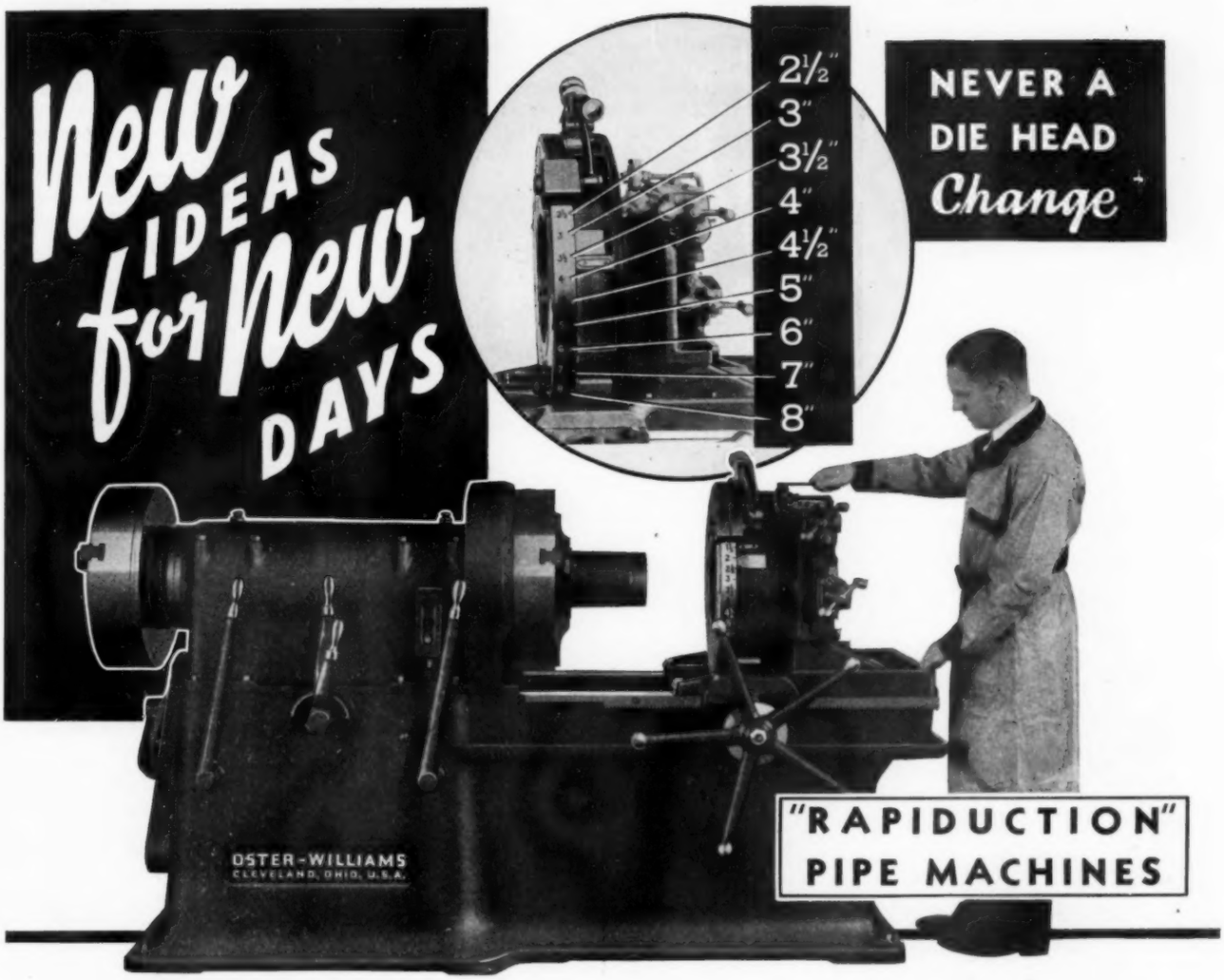


and lathe face plates. The T-shaped base of the clamp slides into the T-slot of any machines equipped with T-slotted tables or face plates. It is clamped quickly directly over the work by use of a swivel screw. Tensile strength of the clamp is 70,000 lb. per cu. in.

Zernickow Tachometers Feature Improvements

The line of stationary tachometers offered by O. Zernickow Co., 15 Park Row, New York, N. Y., now feature ball bearing pendulum pivots, a ball bearing swivel link, and a ball bearing driving spindle, making the tachometer free running. It is claimed that these tachometers will run continuously for long periods without lubrication, without losing accuracy of calibration. Accuracy is held to within 0.5 per cent.

These tachometers have a 6 in. diameter dial mounted on a 2¾ in. deep housing, and weigh, with brackets, 2¾ lb. They will show at a



YOU CHANGE THE SIZE BUT NOT THE DIES, WITH A "RAPIDUCTION"

Here's another one of OSTER'S "New Ideas for New Days"— new production speeds for today's demands, made possible because *one* "RAPIDUCTION" Die-Head and only *one* set of chasers handle all pipe sizes of the same pitch, *without change*.

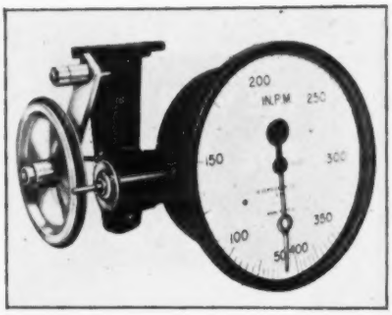
High labor cost, today, requires maximum production from every piece of equipment in your shop, to *save* time. The "RAPIDUCTION" will do just that on your pipe threading jobs, with both its "no change" die-head and its wide range of spindle speeds.

"RAPIDUCTIONS" are made in four sizes No. 4 - 1" to 4"; No. 6-A - 1½" to 6"; No. 8 - 2½" to 8"; No. 12 - 3½" to 12".

OSTER THREADING EQUIPMENT WILLIAMS

Let us quote you on the right size "time saver" for your requirements — there's no obligation of course.

THE OSTER MANUFACTURING CO.
2049 EAST 61st STREET
CLEVELAND • OHIO • U. S. A.



glance, without the use of a stop watch, the revolutions per minute, right or left, of revolving objects, the surface or peripheral speed in any unit, such as inches, feet, yards, etc., speed variations occuring during a fraction of one revolution, and may be used as hand tachometers.

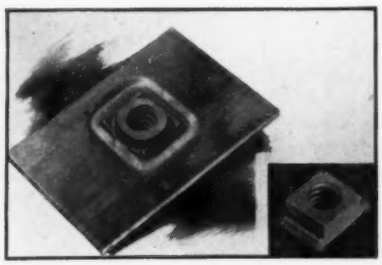
Sellstrom Welding Helmet Has Lift-Front Lens Holder

No. 220S welding helmet offered by Sellstrom Mfg. Corp., 615 N. Aberdeen St., Chicago, Ill., weighs only 15 oz. complete with lens and holder. This helmet is fitted with a Type AA lens holder in which inner and outer frames have concealed spring hinges which allow the outer holder to be raised or lowered quickly. This holder

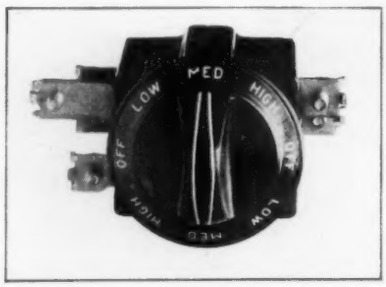
is not riveted to the helmet, but is interchangeable with other lift-front lens holders. These lift-front holders give the operator a dense lens in the outer holder and a clear or less dense lens in the inner holder.

FabriSteel Lock Nuts Made for Light Gages

Punched out of a drawn flanged section, "Fast-on" lock nuts made by FabriSteel Products, Inc., Kerr Machinery Bldg., Detroit, Mich., provide a method of increasing the thread area in sheet metal, making practical use of lighter gage metals and simplifying assembly in inaccessible places. The nut is sheared and the hole is located in a one-stroke operation. It only has to be tapped to complete its manufacture. The small square portion of the nut is inserted in the square hole that previously has been cut in the metal, protruding just enough for the four corners to be clinched with a swaging tool. This locking of the nut into position is a positive action, it will not work loose, and any variation in the thickness of the metal automatically is taken care



of. The thread runs to the edge of the nut making practical its use with shorter screws and closer clearances. Thirty-three different lock nuts are available in sizes from No. 6 to ⅜ in. and in various thread diameters.



Hart Motor Switch Is Operated Easily

This on-and-off switch developed by the Hart Mfg. Co., Hartford, Conn., is designed for use on motorized equipment using up to 1 hp. motors. The slow make-and-break principle is claimed to give long, trouble free service. It is intended for use only on a.c. circuits, and may be used for special and selective circuits. It can be installed easily internally or externally. The dial operates easily.

P. S. Electric Stopwatch Totalizes to 10,000 Seconds

The "Time-It" electric stopwatch offered by Precision Scientific Co., 1750 Springfield Ave., Chicago, Ill., has an

easily read split-second indicating counter which totalizes to 10,000 sec. (2 hr., 46 min.) before repeating. Readings are direct to 0.10 sec. The counter can be reset to zero from any reading or successive readings totalled. The instrument is driven by a continuous-duty synchronous motor equipped with an automatic built-in brake. The instrument can be used wherever it can be plugged into a 110 volt a.c. circuit.

Ajax Flexible Couplings Made from S.A.E. 1020 Steel

Two forged steel flexible couplings, with 1⅛ and 1⅝ in. maximum bores respectively, have been announced by the Ajax Flexible Coupling Co., Westfield, N. Y. These couplings are designed for heavy-duty service with a high factor of safety. Flanges are forged from S.A.E. 1020 steel. Rubber bushings and graphite bronze bearings provide resilient flexibility, positive drive, free end float and eliminate noise, backlash and lubrication problems.

Hexacon Soldering Iron Has 700 Watts Capacity

The No. 700 electric soldering iron offered by Hexacon Electric Co., 161 W. Clay Ave., Roselle Park, N. J., is recommended especially for extra-heavy soldering jobs. Having 700 watts capacity, this iron uses a 1¾ in. diameter screw-type tip. The element is housed in a damage-proof hexacon barrel made of steel. The element is protected from all mechanical injury caused by denting of the element housing. Due to its shape, the iron can be held in a vise when replacing or filing the tip.

Acheson Surfacer Treatment Permits Plating of Plastics

Wood, phenolic products, ebonite and other non-conducting materials can be electroplated after using a surface treatment developed by Acheson Colloids Corp., Port Huron, Mich. The treatment consists of applying a coating containing a hardenable organic colloid, a hardening agent

and colloidal graphite, suspended in water, to the part by dipping, brushing or spraying. The coating hardens on exposure to light and renders the surface conductive, permitting the electrodeposition of copper and other metals. The coating is not affected by copper sulphate or cyanide solutions, and may be applied at normal or elevated temperatures. The treatment also may be used directly in the preparation of electrical resistance elements by applying it to paper, for example, or for coating normally metallized surfaces of electric insulators where a certain amount of electrical conductivity is desired.

Silver Plating Possible By Improved Brush Method

Rapid Electroplating Process, 1414 S. Wabash Ave., Chicago, Ill., has announced development of a process by which silver platings of 0.0002 to 0.001 in. thick can be applied economically. This process consists of an improved undercoat with superior wetting qualities as well as an improved plating compound. These are combined in a compound portable kit ready for operation. Current is applied by a transformer-rectifier or dry batteries. It is claimed that thin, non-porous plating can be applied by the brush method.

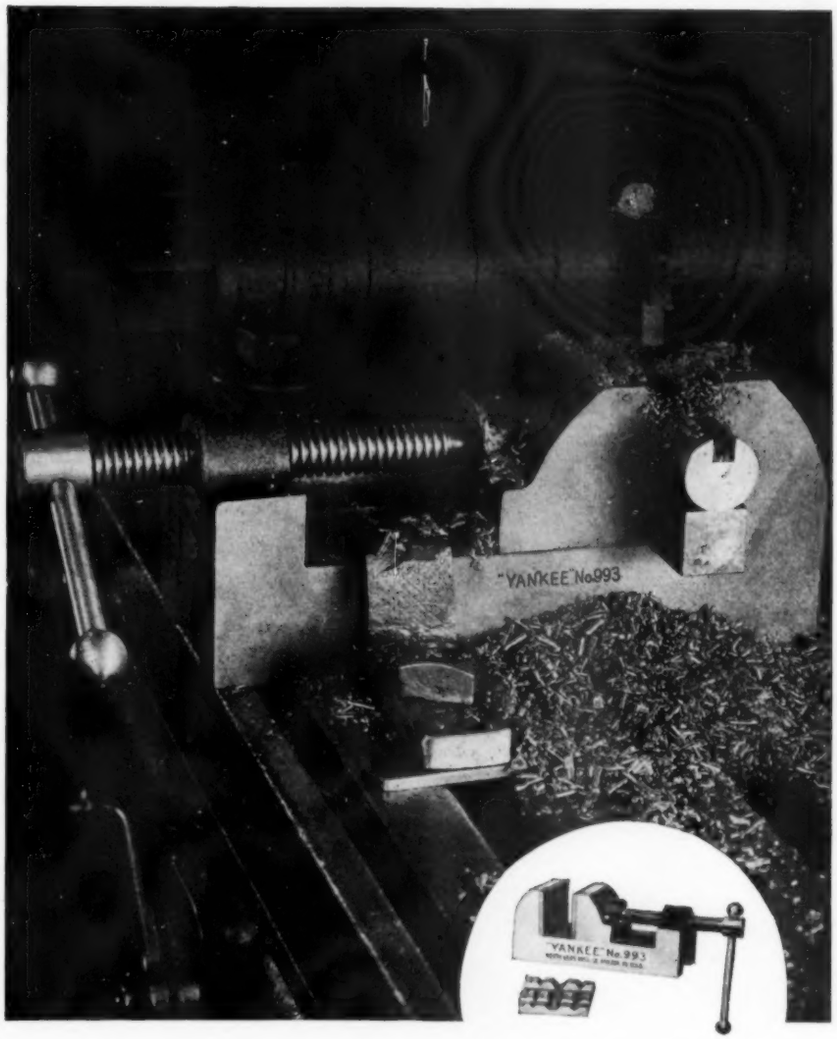
NEW MATERIALS

Bethlehem Tool Steel Has Increased Carbon Content

A special high-carbon, high-vanadium tool steel suitable for heavy hogging cuts, as well as fine finishing operations, has been developed by Bethlehem Steel Co., Bethlehem, Pa. Marketed under the name of "Red Tiger," this steel represents a departure from standard practice in that the carbon content has been increased to give extra hardness, averaging 65 to 68 Rockwell C after heat treatment. This has been attained without excessive brittleness. Physical tests show impact properties approximately the same as those of standard carbon 18:4:1 high-speed steel.

The high shock resisting properties makes it possible to use this steel on intermittent cuts without danger of breaking the tool. Good red hardness values make it suitable for heavy hogging cuts. The analysis of the new steel is approximately as follows: Tungsten, 18 per cent; chromium, 4 per cent; vanadium, 2.5 per cent; molybdenum, 0.60–0.80 per cent; carbon, 1 per cent. Standard heat treatment, without any extra precautions, is used.

The following is the recommended heat treatment: Preheat the steel slowly to between 1500 and 1650 F. and soak thoroughly. Transfer to the hardening furnace, heat rapidly to



"YANKEE" VISE
SPEEDS PRODUCTION

"Yankee" is a *fast-production* vise—different from any other vise in your shop! Squared all sides. Designed for continuous work—from bench to machine and back again—accurate results and no delay. "Yankee" Vise illustrated above, made in four sizes: No. 991, 1½" jaw width. No. 992, 2" jaw width. No. 993, 2¾" jaw width. No. 994, 4" jaw width. Hardened steel block, V-grooved, supplied for holding rounds.

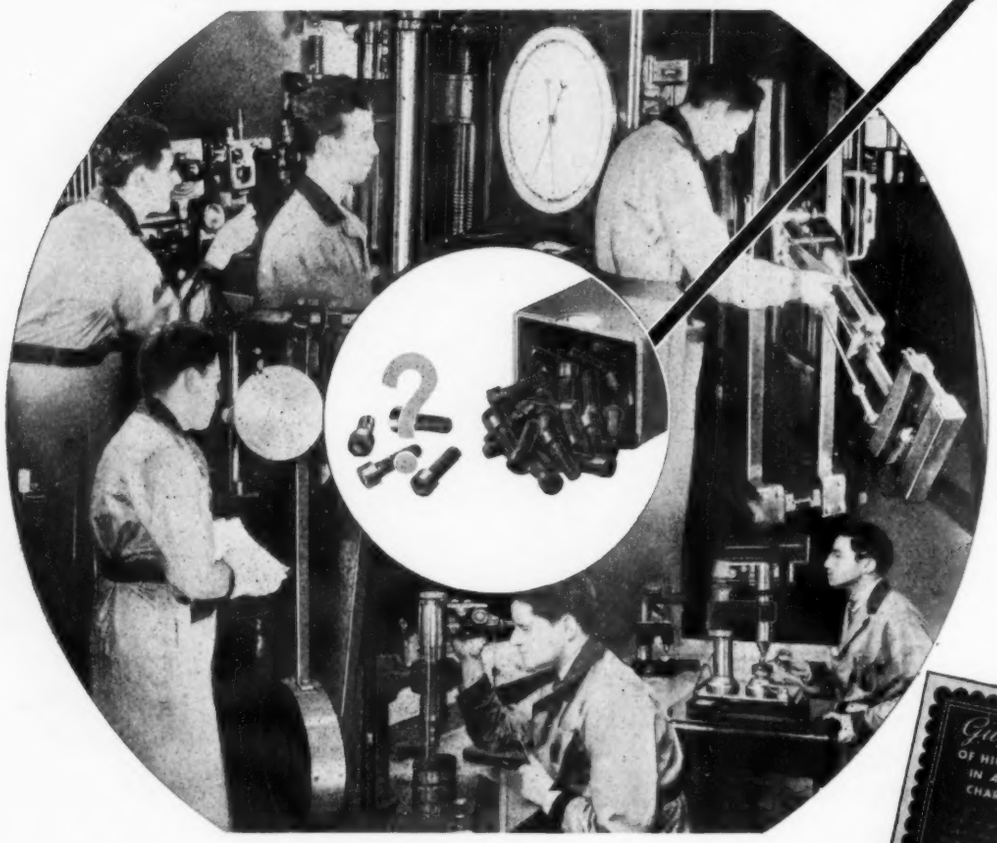
"Yankee" Vise also available with removable swivel base. Sizes, Nos. 1991, 1992, 1993 and 1994.

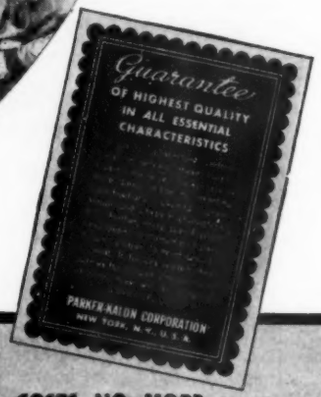
ORDER FROM YOUR SUPPLY HOUSE. FOR "YANKEE" VISE CIRCULAR, WRITE NORTH BROS. MFG. CO., DEPT. AM, PHILADELPHIA, U. S. A.

NORTH BROS. MFG. CO., PHILADELPHIA, U.S.A.

NO "Doubtful Few"

CAN SLIP THROUGH





Parker-Kalon's unique Quality-Control Laboratory rules out "doubtful" screws that threaten fastening jobs

PUT Parker-Kalon Fastening Devices on your assembly line and you'll end troubles with the "Doubtful Few" . . . those few imperfect units in a box that won't drive properly or make satisfactory fastenings. Such screws are ruled out by Parker-Kalon's scientific "3rd degree" of tests and inspections.

A $250,000 Quality-Control Laboratory that has no counterpart in the industry has made it possible to hold Parker-Kalon Hardened Self-tapping Screws, Socket Screws, and other fastening devices to higher standards than ever before could be attained. Precision equipment controls every step in production. "Doubtful" units *can't* slip through!

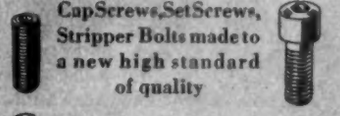
Specify PARKER-KALON on your next order . . . get fastening devices guaranteed by the most modern plant in the screw industry. Parker-Kalon Corp., 194-196 Varick St., New York.

SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS

COSTS NO MORE *to get this Parker-Kalon Quality-Control Guarantee with every box of . . .*

Hardened Self-tapping Screws
Types, sizes, head-styles for every assembly of metal or plastics

Cold-forged Socket Screws



Cap Screws, Set Screws, Stripper Bolts made to a new high standard of quality

Wing Nuts-Cap Nuts-Thumb Screws
Cold-forged . . Neater, Stronger

Quality-Controlled **PARKER-KALON Fastening Devices**

between 2350 and 2375 F., and oil-quench immediately to about 200 F. Allow to cool to room temperature, charge into a tempering furnace and draw to 1050 F. If properly followed, this hardening procedure will give a rockwell hardness between 65C and 68C. This steel is supplied as bar stock, heat-treated tool bits, and turning plugs used with special tool holders.

Flexrock "Bakeflex" Finish Protects Wood Floors

Suitable for use on nearly every type of floor, the "Bakeflex" finish offered by Flexrock Co., 2300 Manning St., Philadelphia, Pa., is practically transparent, with only a slight amber tinge. It may be used as a filler as well as a preservative. The bakelite base of this material gives it acid resistance, fire resistance, dirt resistance and other advantages.

TRADE PUBLICATIONS

ANTI-FREEZE Bulletin No. R-16, available from Sullivan Machinery Co., Michigan City, Ind., discusses various methods for preventing freezing of air lines.

AUTOMATIC LATHE A 16-page illustrated by Jones & Lamson Machine Co., Springfield, Vt., provides specifications and discusses design features of the 8-in. Fay automatic lathe.

BEARINGS A leaflet issued by Bower Roller Bearing Co., 3040 Hart Ave., Detroit, Mich., describes the "Micro Honing" bearing race finishing process.

FLAME CUTTING A 4-page bulletin issued by Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y., describes the "Airco" No. 10 "Planograph."

MACHINE TOOLS Catalog No. 40, available from Dept. 7, Atlas Press Co., Kalamazoo, Mich., contains 72 pages of information concerning a line of lathes, drill presses, shapers and accessories.

MOTORS Features of the Type K totally inclosed fan-cooled polyphase and single-phase motors of ½–100 hp. are included in a 4-page illustrated bulletin, No. K-20, issued by Howell Electric Motors Co., Howell, Mich.

MOTORS Bulletin No. GEA-1191B, published by General Electric Co., Schenectady, N. Y., provides 52 pages of design, engineering and application data concerning synchronous motors.

TURRET LATHES Warner & Swasey Co., Cleveland, Ohio, has begun publication of a four-page bulletin called "Blue Chips." Written especially for

16 O.K.'s CERTIFY THESE SOCKET SCREWS

One of sixteen precision steps in Parker-Kalon Quality-Control

DOUBTFUL FASTENINGS ARE PREVENTED BY PARKER-KALON QUALITY-CONTROL

Unmatched assurance of superior fastening jobs is obtained when your socket screws have been produced under Parker-Kalon Quality-Control. Every screw in a box is guaranteed by a 16-point test-and-inspection routine that eliminates doubtful units . . . screws that might gum-up fastening jobs or fail in service.

Below is an outline of the rigid control routine that is made possible only by Parker-Kalon's $250,000 Quality-Control Laboratory. Read it . . . see why "Quality-Controlled" means uniformly "better than good enough."

Order Parker-Kalon next time . . . and look for the Quality-Control Guarantee that vouches for this extra quality. For free samples and distributor's name, write Parker-Kalon Corporation, 194-196 Varick Street, New York.

Quality-Controlled

16-point test and inspection routine covers: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth and centricality; Class 3 Fit Threads; Clean-starting Threads.

PARKER-KALON
COLD-FORGED
Socket Screws

IMPORTANT to you—important to ALL users of cold drawn steel, are the modern facilities of Wyckoff—one of the largest independent producers of cold finished steels in the country—completely equipped to produce every known specification in cold drawn carbon alloy and leaded steel.

Every check and safeguard is employed to assure those qualities of size, accuracy, machinability or surface condition so essential to users of cold drawn steels. Giant drawing machines of the most modern type, manned by skilled craftsmen, add their quota of strength, shape and finish . . . super-sensitive micrometers assure minute accuracy to all ground sizes. With a combined plant capacity of more than 135,000 gross tons of finished steels per year with a coast to coast organization of progressive distributors to serve you—you can always specify Wyckoff Cold Finished Steels with absolute confidence that your particular requirements will be met and delivered with telegraphic promptness.

Trained metallurgical and technical experts are always at *your* disposal anytime, anywhere!

WYCKOFF DRAWN STEEL COMPANY
FIRST NATIONAL BANK BLDG., PITTSBURGH, PA.
3200 SO. KEDZIE AVENUE · CHICAGO, ILL.
Mills at Ambridge, Pa. and Chicago, Ill. . . . Warehouse Stocks in Principal Cities . . . Manufacturers of Carbon and Alloy Steels . . . Leaded Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2"

turret lathe operators, it is illustrated with drawings and photographs and includes much material contributed by readers.

VIBRATING SCREENS Bulletin No. 28, isued by Ajax Flexible Coupling Co., Westfield, N. Y., contains 6 pages discussing features of the "Ajax" line of vibrating screens.

WELDING Catalog No. 106, issued by the Stoody Co., Whittier, Calif., discusses an extensive line of welding and hard-facing equipment and includes technical information and data concerning the hard-facing process.

WELDING General Electric Co., Schenectady, N. Y., has published a 40-page illustrated catalog providing specifications of its line of arc welding electrodes. Identified as Bulletin GEA-1546F, it is intended as a guide for selection of electrodes, and also gives suggestions on technique.

NEW BOOKS

INDUSTRIAL DESIGN—*By Harold Van Doren. 388 pages. Published by McGraw-Hill Book Company, 330 West 42nd St., New York City. $4.50.*

In his introduction to this comprehensive textbook, the author says, "For ten years (I) . . . have practiced this new profession (of industrial design) with no thought but to create merchandise that the public would buy. To add the role of teacher temporarily to that of designer is a task undertaken only with a view to speeding the day when design will be given its place in the industrial world with as little question as engineering, advertising or management itself."

The author also expresses the hope that this volume will give impetus to the teaching of product design in industrial and vocational schools, in art institutes, in colleges and in universities. He believes that few courses are being offered as yet partly because of the lack of an adequate textbook. This need he attempts successfully to fill.

The book is divided into four parts: 1) a general discussion of the new profession of industrial design; 2) an elementary treatise on designing in three dimensions; 3) description of the technique of industrial design; and 4) a discussion of the practice of the profession, the final chapter giving case histories of the development of three products already on the market.

Profusely illustrated with clear line drawings, the book contains at the end a large number of photographs showing a representative group of product designs chosen chiefly for their sales success. The book is attractively printed. The writing is simple and to the point.